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ABSTRACT

This manuscript contains 13 curriculum units designed to enhance differentiated instruction for learners with special needs from grades 1-12, including gifted students. It integrates Benjamin S. Bloom's levels of cognitive understanding with Howard Gardner's eight domains of intelligence to provide a framework for individualized instruction. Each unit has activities for the eight multiple intelligences (logical-mathematical intelligence, linguistic intelligence, bodily-kinesthetic intelligence, spatial intelligence, musical intelligence, interpersonal intelligence, intrapersonal intelligence, and naturalistic intelligence) at each of Bloom's taxonomic levels: knowledge, comprehension, application, analysis, synthesis, and evaluation. The manuscript begins by explaining Bloom's and Gardner's contributions to educational research in the area of differentiated instruction, and then provides the following curriculum units: (1) "Solar System" (Jeff Hendrickson and Renee Hendrickson); (2) "Energy" (Chris Hiroto); (3) "Antarctica" (Amy La Jocies); (4) "Author Study of Chris Van Allsburg" (Linda Hurley Lord); (5) "Omnipotent Oceans" (Sheri Marshall); (6) "Starting a Home Business" (Vicki L. Malan); (7) "Fractions" (Denise C. Moriarty); (8) "Whole Numbers and Decimals" (Denise C. Moriarty); (9) "Geometry" (Denise C. Moriarty); (10) "Ancient Egypt" (Audrey C. Rule); (11) "Energy" (Cynthia Rust); (12) "Garden Plants" (Amy Smith); and (13) "Rain Forests" (Jaime Watson). (Contains 11 references.) (CR)

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Activities for Differentiated Instruction Addressing All Levels of Bloom's Taxonomy and Eight Multiple Intelligences

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Introduction by Denise Moriarty

This work integrates ideas from the work of two well-known 20th century educational researchers, Benjamin S. Bloom and Howard Gardner. The purpose of this document is to facilitate planning and use of differentiated instruction in the classroom.

"Differentiated instruction is a teaching approach that provides a variety of learning options to accommodate differences in how students learn. Some differences that impact learning are related to the student's prior knowledge and experience, learning preferences and modality, cognitive level, and personal interest" (Skowron, 2001 ~~2000,~~ p.1). Why is there a need for differentiated instruction? Every classroom contains a community of learners with a wide range of abilities and interests, especially inclusive classrooms. Expecting the same product from each learner is unrealistic and frustrating for students. Most classrooms have identified gifted students or students who already know part of the curriculum. Such students would benefit from individualized project work for enrichment or continued challenge and growth. Optimal learning occurs when a student is challenged to cognitively process material that is neither too difficult nor too easy. Maximum learning takes place at a level linking "mental and emotional focus"(Skowron, 2001, p.12). Creating the environment for this link to occur is the ultimate teaching goal.

Classrooms that are structured to accommodate differentiated instruction, present increased opportunity for students to receive individualized attention and instruction. Referring to a 1980 study, Bloom(1986) reports, "There were very great differences in the students' cognitive achievement, attitudes and academic self-concept under tutoring [individualized instruction] as compared with conventional group

instruction."(1986) Another reason for differentiating instruction relates to teacher professionalism. Expert teachers are attentive to students' varied learning needs (Danielson, 1996); to differentiate instruction, then is to become a more competent, creative, and professional educator."(Tomlinson, 2000, p.3)

In the following sections, Bloom's and Gardner's contributions to educational research in the area of differentiated instruction will be examined.

Benjamin S. Bloom

Benjamin S. Bloom is a recognized name in educational research of the 20th century. Bloom and his colleagues undertook the daunting task of creating a taxonomy of educational objectives. Noting that a biological taxonomy allowed biologists to communicate more efficiently and accurately their classification system and therefore their understanding of the animal kingdom, Bloom sought a similar tool for educators.

Instead of examining how to teach, what to teach, or when to teach it, Bloom focused his research on educational outcomes. For any given curriculum, knowing the intended outcome or objective determines the what, how, and when of teaching. As with many areas of life, achievement of a goal is only met by understanding the goal, then working towards it. Thus, Bloom's research and work "focused educators on outcomes... what students should know and be able to do" (Woo, 1999, p.22).

Prior to the publishing of "Taxonomy of Educational Objectives and Cognitive Domain" (Bloom, 1956), also referred to as "Bloom's Taxonomy", educators discussed desired outcomes in unclear terms. The taxonomy provided a six-tiered framework of educational outcomes with each level clearly defined. These levels form a hierarchy,

organized according to cognitive complexity, so abilities needed at the lower levels are also needed for success at each higher level.

A description of Bloom's six levels follows.

Level I - Knowledge. The knowledge objective is primarily concerned with recall, remembering facts and information (processes, directions, criteria, methodology), and the use of cues to retrieve information from the file cabinet of the mind. Examples: Recall multiplication facts; name the criteria for classifying rocks...This is the lowest level of learning outcomes.

Level II - Comprehension. This is considered the lowest level of understanding and involves interpreting the material. "The emphasis is on the ability to grasp the meaning and intent of the material." (Bloom, 1956, p. 89)

Level III - Application. " A demonstration of comprehension shows that a student can use an abstraction when the use is specified. A demonstration of *application* shows he (/she) will use it correctly, given an appropriate situation, without prompting" (Bloom, 1956, p. 120). In other words, the ability to apply information or concepts in a new situation or to problem-solve using the information.

Level IV - Analysis. This outcome asks the learner to be able to sort through the elements, relationships, or organizational principles of the material to understand its organizational structure. Examples include distinguishing fact from hypothesis, detecting logical fallacies in an argument, recognizing form and pattern. (Bloom, 1956)

Level V - Synthesis. Synthesis is "...the putting together of elements and parts so as to form a new whole...the student must draw upon elements from many sources and put these together into a structure or pattern not clearly there before." (Bloom,

1956, p. 162). This can be thought of as using previous knowledge to create new concepts, relating knowledge to several areas, predicting, drawing conclusions and hypothesizing. Examples: writing creatively, giving extemporaneous speeches, planning a unit of instruction and making mathematical discoveries and generalizations (Bloom, 1956).

Level VI - Evaluation. This level is defined as" the making of judgments about the material. It involves the use of criteria as well as standards" (Bloom, 1956, p.185) for evaluating. It can be qualitative or quantitative and the criteria can be given or determined by the evaluator. Learning outcomes are at the highest level here because they contain elements of all other categories.

Howard Gardner

As a graduate assistant at Harvard, Howard Gardner volunteered to work on a project "to begin to understand and to chart through research, the human development of artistic and creative abilities" (Fernie, 1992). At the time, little was known about the development of artistic or creative abilities, so the researchers based the name of the project on what they had to start with, hence the name Project Zero. Since then, research for and resulting from Project Zero has become the source and catalyst for almost all of Gardner's work.

Howard Gardner, a psychologist working in applied developmental areas, has research ranging from charting the human development of artistic and creative abilities to brain research. Finding that damage to a specific area of the brain could cause the loss of one specific function, while leaving a seemingly related function intact, captured Gardner's attention. This led him to view the prevailing pedagogy on intelligence as too

narrow; to recognize instead that "people have a wide range of capacities" (Viens, 2002). Through this expanded vision and his continuing work at Harvard and Boston University on projects dealing with the mind and human potential, he came to believe that "we all possess at least seven intelligence areas or seven ways of knowing" (Lazear,1992). In his book, *Frames of Mind: the Theory of Multiple Intelligences* (1983), Gardner stated his case for what has become known as multiple intelligences. In *Intelligences Reframed* (1999), Gardner expanded his earlier set of intelligences to eight.

Objective and Intended Use

The objective of this work is to integrate Bloom's levels of cognitive understanding with Gardner's eight domains of intelligence to provide a framework for individualized instruction.

As an instrument of differentiated instruction, this work can be used in many ways. Activities at the knowledge and comprehension levels can be useful to remediate students. Activities at application or evaluation levels may serve to enrich and challenge students. Actually, any level may be used as remediation or enrichment depending upon the student's cognitive level. Activities from this project could be offered as alternatives to classroom assignments, thereby allowing students independence and choice in their educational process. Activities from this project may be used at a learning center in the classroom as an extension to the unit of study. Some of the activities for differentiating instruction might also be used as a year long extra-credit center. As Bloom's levels increase, the work and energy required to complete each activity increases. Point values could be established for each level (for example,

Knowledge: 50 pts., Comprehension level activities 100 pts...) Not only would this allow students to work at their appropriate levels, it may motivate them to push on to the next levels of understanding. With the outcomes clearly defined for our students, the possibility exists that they will feel more challenged; much as a video game challenges them to the next level. Students will now have a clearer conception of what is required to achieve the next stage.

Teachers may develop additional activities for these units. More than one activity might be made available at each level and intelligence from which students may choose. This could become a living document in the classroom that grows over time, offering yet more student choice and independence. Students may work on the intelligence in which the are strongest and continue to develop that intelligence, or students may choose to work in intelligences in which they are not so strong in order to develop those areas of their intellects.

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Solar System by Jeff Hendrickson and Renee Hendrickson

Logical-mathematical Intelligence

Knowledge	List the planets in their correct order from the sun.
Comprehension	Explain which planet has the shortest orbital period and which has the longest.
Application	Based on the speed of a rocket, schedule a trip from Mercury to Pluto with stops at all of the planets.
Analysis	Graph and calculate how much you would weigh on each of the planets.
Synthesis	Design a space vehicle, making sure to include all dimensions and specifications of the vehicle.
Evaluation	Create a survey to evaluate whether or not people think that we will someday colonize another planet in our solar system.

Linguistic Intelligence

Knowledge	List ten words that describe the solar system.
Comprehension	Draw and label the planets.
Application	Using information gained through your research, determine if the planet Mercury could sustain life.
Analysis	Compare and contrast Earth and Venus using a Venn diagram.
Synthesis	Produce a commercial to persuade travelers to visit one of the planets.
Evaluation	Decide which planet you would like to live on and write a letter to your parents explaining why you will move there.

Bodily-kinesthetic Intelligence

Knowledge	Act out the rotation and revolution cycles of the planets.
Comprehension	Describe and demonstrate how much a baseball would weigh on each of the planets.

Application	Make a planetarium.
Analysis	Inventory and gather a list of supplies that you will need to bring with you to the moon.
Synthesis	Design a play based on a voyage to the planet Mars.
Evaluation	Have the student simulate a rocket launch and recommend to the class how to best prepare physically to be an astronaut.

Spatial Intelligence

Knowledge	Match the stars of a constellation to a picture of their likeness.
Comprehension	Locate at least three constellations in the sky.
Application	Take and use pictures of constellations in the night sky to illustrate their location and relative size.
Analysis	Cut a large photo of the earth into pieces so they can be arranged into a 3-D puzzle of the earth.
Synthesis	Create a mini planetarium of plastic garbage bags to illustrate the constellations in the night sky
Evaluation	Have the student select criteria to be used in a classroom newspaper of articles written about space.

Musical Intelligence

Knowledge	Memorize an acronym for remembering the planets and their order (My Very Educated Mother Just Served Us Nine Pizzas)
Comprehension	Report on any songs that contain the names of planets
Application	Give an example of a song for the class to use to rewrite as a ballad of the planets.
Analysis	Determine what instruments could be used in a soundtrack to represent the sounds of objects traveling through the atmosphere
Synthesis	Create a 3-chord melody for each of the planets and explain why it is representative of that planet.
Evaluation	Have the student listen to various soundtracks from space films and evaluate which best represents space travel.

Interpersonal Intelligence

Knowledge	Read a book to the class that lists all of the planets in the solar system.
Comprehension	Describe to a partner the size of each planet and its relationship to the Earth,
Application	Dramatize for the class each of the theories of creation through the use of pantomime.
Analysis	Pretend to be a television reporter who has to interview classmates to see what knowledge they have about the solar system.
Synthesis	Create a puppet show for the class to show what life would be like when people colonize Mars.
Evaluation	Mediate a discussion of the class to decide and recommend which classmates should be allowed to go on a voyage to the moon to represent your school.

Intrapersonal Intelligence

Knowledge	Memorize the planets in their order using the method that is most effective for you.
Comprehension	Have the student describe the way that they were able to learn facts about the planets and solar system.
Application	Demonstrate how the solar system has had an effect on your life and will continue to effect you.
Analysis	Have the student inventory all of the things that they know about the solar system and the things that they would like to learn.
Synthesis	Have the student design a rocket that will best suit them in space travel and explain why they made the specifications.
Evaluation	Have the student justify what pieces of the unit were successful for them and should be used in the future.

Naturalist Intelligence

Knowledge	Use a telescope to locate and observe the moon during a stargazing night.

Comprehension	Describe the characteristics of a crater observed on the moon and explain how it got there.
Application	Make a model to demonstrate the greenhouse effect on a planet.
Analysis	Classify animal groups that could survive on other planets for possible relocation.
Synthesis	Design and create a biosphere that is self-contained for animals and plants to be used in colonizing another planet.
Evaluation	Arrange a debate to discuss the pros and cons of sending trash into outer space.

Energy by Chris Hiroto

Logical-Mathematical Intelligence

Knowledge — Name the electrical measurement that was named after the Italian scientist, Alessandro Volta.

Comprehension — Explain two advantages of using electrically powered vehicles over gasoline or diesel powered vehicles in terms of fuel efficiency.

Application — Demonstrate the path of least resistance electricity follows using an electric circuit (source, path, and load) in a table lamp, toaster, and a door bell.

Analysis — Brainstorm a list of ten common items made from different materials, such as a copper penny, a rubber band, aluminum foil, a wood block, cork, a plastic comb, a fabric pot holder, and categorize them as either conductors or insulators of electricity.

Synthesis — First, design a working electrical circuit given a battery, wire, and a flashlight bulb. Make an electronic quiz game. Fold a large index card in half and punch three holes, spaced evenly apart, on the side opposite the folded side. Unfold the card so the holes are on the left and right side of the open card. On one side of the card, tape strips of aluminum foil from each hole on the left side to another hole on the right side, making sure that the foil covers the punched holes. Turn the card over. Write terms (math, words, etc.) at each hole on one edge and the answer to the problem at its connected, opposite hole. Use your working circuit to match the problem with the correct answer.

Evaluation — Conclude what will happen when an additional load is added to an electrical circuit without increasing its power supply.

Linguistic Intelligence

Knowledge — Tell me the meaning of *circuit* and the word parts of *trans* and *form* from the word *transformer*.

Comprehension — Write a newspaper article that explains why a golfer should not hide under a tall tree on a golf course during a thunderstorm.

Application Write a letter to a friend explaining the principle involved when a citywide power outage occurs.

Analysis Write an essay that compares and contrasts the advantages and disadvantages of using hydroelectric or nuclear means as a power source.

Synthesis Imagine a world without electrical energy. Write a documentary that follows a person for a day on their 12th birthday.

Evaluation Evaluate the story of the "Three Little Pigs" and write a critical report assessing the energy efficiency of each of their three homes.

Bodily-Kinesthetic Intelligence

Knowledge Name two activities that burn many calories and two activities that burn few calories.

Comprehension Pretend you are an electron flowing through a light bulb, act out and describe what you see as you travel along the electrical path into the light bulb and out again.

Application Dramatize how electrical signals in our nerves are used to transmit messages to our brain.

Analysis Make an electric motor using simple materials. Analyze how components of the motor convert electrical energy to mechanical energy to make the motor work.

Synthesis Construct a game that uses a working electrical circuit to test our hand-eye coordination. Make an electrical circuit using a battery, path, and load (light or buzzer). Using a rigid conductor, such as a piece of clothes hanger, make several bends and loops in the hanger. Slip an enclosed conductor, such as a paper clip, around the hanger. Stand the hanger upright and secure to a block of wood. Use an insulated wire to connect one end of the clothes hanger to the positive side of the battery. Using an insulated piece of wire, connect the paper clip to one terminal of the load (the other load terminal will be connected to the negative battery terminal). Test hand/eye coordination by moving the paper clip along the clothes hanger. Touching the paper clip to the hanger will complete the circuit path and will activate the load. The objective is to proceed from one end of the hanger to the other without activating the load.

Evaluation — Evaluate how riding a bicycle is similar to a portable drill that runs off a battery.

Spatial Intelligence

Knowledge — Tell the rule for determining the distance of a storm by counting the seconds between seeing the lightening flash and hearing the clap of thunder generated from the lightening flash.

Comprehension — Visualize yourself as the letters (dot, dot, dot) in the electrical system of Morse Code. Describe how you would travel from a transmitter from one location to the receiver at another location

Application — Illustrate, through a mobile, famous people in history and their contributions to the field of energy.

Analysis — Construct a global map that diagrams where the earth's oil reserves are located. Analyze U.S. policies and actions toward the Middle East region based upon the distribution of oil reserves depicted on your global map.

Synthesis — Design an energy efficient home for two people.

Evaluation — Evaluate how building materials and the location of a home affects the amount of energy used by the occupants of the home for heating, cooling, and lighting.

Musical Intelligence

Knowledge — List five musical instruments or objects that produce music that rely on electricity to operate.

Comprehension — Express how you feel about the sun's energy in a jingle, poem, or song.

Application — Determine the pitch and loudness (decibels) of 10 machines. Make a chart that diagrams these machines from low to high pitch and from soft to loud noise.

Analysis — Examine the songs in "The Magic School Bus" series. Infer which are related to energy conservation.

Synthesis — Revise the lyrics of "Mary Had A Little Lamb" to create a song related to energy.

Evaluation Collect 10 different items that give audio output, such as radios, CD-players, boom boxes, cassette recorders, etc. Rate each as to the quality of the sound energy that it emits.

Interpersonal Intelligence

Knowledge Tell a partner the definition of a good conductor and a good insulator.

Comprehension Describe to a partner how an animal might feel if its habitat were destroyed because humans needed to extract oil from that same area.

Application A dam for hydroelectric power is going to be constructed that will change the habitat of the spotted snail, causing it to become extinct. Building the dam will result in less cost for electricity for millions of people. Environmentalists do not want the dam built because it will result in the spotted snail becoming extinct. Apply the principles of "greatest good for the greatest number" and "respect for all living things" to this problem.

Analysis Compare and contrast the benefits of building the dam from the standpoint of the people who will benefit from the dam construction verses those who want to save the spotted snail.

Synthesis Propose some solutions that might result in getting the dam built while also meeting the concerns of the environmental group who have concern for the spotted snail.

Evaluation Survey 10 people and record their responses to this problem. Evaluate their logic and list their arguments in order of best supported to least supported.

Intrapersonal Intelligence

Knowledge Memorize the system of Morse Code. Pretend that you are trapped in a mine that has collapsed and have to signal rescuers that you are alive. Send the message "I am alive", in Morse Code, by tapping a pencil against a hard surface.

Comprehension The electrical power in your house goes off during a storm and the darkness frightens your younger sister or brother. Explain your feelings to them

Application Determine five things you can change about your daily life that would conserve energy.

Analysis — You are the owner of an oil company who employs thousands of people. You are also an inventor who has just discovered an energy-saving device that will greatly benefit all of society. If you sell your invention you will not have to work for the rest of your life but you will have to close your business and thousands of people will be unemployed. Examine your motivation for your decision.

Synthesis — Name three career fields in which you are interested. Tell how energy issues impact each and for each one, develop a plan on how you can improve the situation.

Evaluation — Assess how others in your family might also conserve energy. List five of your best personality traits. Decide how you might use your traits to approach them to make energy improvements.

Naturalist Intelligence

Knowledge — Name three different types of lightening.

Comprehension — Discuss how a particular waste product might be used as a power source to provide a service to a consumer; example: burning garbage as a substitute for heating oil.

Application — Apply the principle of density to explain why an oil spill in water is difficult to clean up.

Analysis — Analyze how nuclear power plants might be harmful to living and nonliving things in the event of a meltdown.

Synthesis — Spawning salmon of the Pacific Northwest return from the sea to their natural spawning grounds. Their numbers have greatly decreased because they have difficulty breaching the dams that were constructed to provide hydroelectric power to generate electricity. Formulate a plan on how these salmon might be assisted so they can more easily reach their spawning grounds to prevent them from becoming extinct.

Evaluation — Evaluate the statement, "all life on earth gets its energy from the sun" in light of recent discoveries of sulfur-bacteria in caves, micro-organisms found in deep rock formations, and sea life surrounding black smokers on the sea floor.

Antarctica by Amy La Jocies

Logical-Mathematical Intelligence

Knowledge — Tell the area of Antarctica in square miles.

Comprehension — Explain why there are different amounts of snowfall on the coast of Antarctica compared with the interior portion of the continent. Identify how much snow falls on each area.

Application — Illustrate five types of penguins in height order. Graph your findings.

Analysis — Play the PENGUIN JUMP GAME with a partner. Roll the dice. One partner is the even number and one partner is the odd number. Compare the numbers rolled on the dice to determine which partner (odd or even) gets to write his or her initial on one of the penguins. The person with the most initials at the end of the game wins.

Synthesis — Design a model of an Emperor Penguin. It should be actual size (4-5 ft. tall). This model may be shared with younger children so that they can measure themselves against the height of the Emperor Penguin.

Evaluation — Assemble data from sources to recommend the maximum length of time an unprotected human without clothes could survive in the Antarctic. Include temperatures and estimated survival time.

Linguistic Intelligence

Knowledge — List ten words that describe Antarctica.

Comprehension — Write a paragraph to express a leopard seal's point of view towards eating penguins.

Application — Dramatize a debate between a hungry penguin and a hungry leopard seal. Perform it for the class.

Analysis — Compare and contrast 5 North American animals with 5 similar Antarctic animals. Name these 10 animals.

Synthesis — Produce a class newsletter about Antarctica. Include facts, jokes, puzzles, pictures, and student opinions.

Evaluation Read three articles detailing specific evidence indicating that Antarctica was once a warm continent. Evaluate their findings to decide if you believe that this icy continent was once warm.

Bodily-Kinesthetic Intelligence

Knowledge Using a penguin made out of black strips of construction paper label the body parts.

Comprehension Explain how penguins deal with their enemies in a skit presentation.

Application Simulate a father penguin taking care of his egg. Put your feet together and try walking across the room with a tennis ball balanced on the top of your feet.

Analysis Analyze the different environments of Antarctica. Make a diorama that shows the ice shelf, inland, sea, etc.

Synthesis Create a penguin circus act, similar to the scene in the book *Mr. Popper's Penguins* by Richard and Florence Atwater.

Evaluation List examples of ways penguins move and interact on the video "Penguins." Decide if penguins interact in similar ways to humans.

Spatial Intelligence

Knowledge Make and label a map of Antarctica. Include all of the surrounding bodies of water.

Comprehension Paint a picture of an iceberg to express the fact that only 10% of the ice is visible above the water.

Application Use origami paper to fold and create Antarctic animals. Use your animals to dramatize an Antarctic scene.

Analysis Arrange pebbles in a small box to represent a penguin's nest. Compare and contrast the nests of the robin, magpie and mallard to the nest of a penguin.

Synthesis Transform a rock into an Antarctic animal. Use cut paper glued onto the rock, paint and other materials of your choice.

Evaluation Photocopy pictures of Inuit and Eskimo animal carvings. Carve these animals out of a bar of soap. Rate all of the carvings for realism on a scale from 1-5.

Musical Intelligence

Knowledge — Listen to the CD "Arctic Glow". (The CDCARD company. Fax 0181 992 0340) Memorize at least one song.

Comprehension — Retell the story of Tacky, the Penguin (Helen Lester, 1990) by singing his responses to the other penguins.

Application — Dramatize how cold it gets in Antarctica in song and dance.

Analysis — Listen to the CD "Arctic Glow" and give examples of the feelings, moods or scenes the different instruments are supposed to represent.

Synthesis — Compose your own song about a baby penguin trying to escape a scavenging Skua Bird.

Evaluation — Determine which instruments in an orchestra would best represent the sounds heard in Antarctica. For example, a cymbal might represent the sound of breaking ice.

Interpersonal Intelligence

Knowledge — Name 5 careers that could involve time in the Antarctic. Include personal characteristics of people that would be suited to these occupations.

Comprehension — Tell a partner what skills a person interested in becoming an Antarctic scientist would have to have. List questions you would ask of a scientist just returning from an Antarctic expedition

Application — Demonstrate how one penguin is chosen to be the leader of the group and how the others might feel when they're not chosen.

Analysis — Examine how scientists collaborate on their Antarctic expeditions. Compare their ways of cooperation and collaboration with the way you cooperate with others.

Synthesis — List five possible/probable interpersonal problems/issues a small group of people isolated for a month in Antarctica would experience. Make a list of ten rules for a group of three scientists to follow in interacting with each other on a long expedition.

Evaluation — Research to find information on Captain James Cook, the supposed discoverer of Antarctica. Judge for yourself if he was the man to discover the continent or not. Write an essay with supporting evidence.

Intrapersonal Intelligence

Knowledge — List the emotions you would experience when going to Antarctica for the very first time.

Comprehension — Explain in writing how you cope with the idea of a leopard seal eating a penguin.

Application — What questions would you want to be asked during a mock interview about the changing environment of Antarctica.

Analysis — Compare your personal philosophy of life and specify if you would change this if you were to spend a week in this desolate area of the world.

Synthesis — Simulate an Antarctic scientist's journal entries. What would you see and do on this icy continent? Include food, wildlife, feelings, etc.

Evaluation — Determine if you would go insane if you actually lived your entire life on this continent. What would your state of mental health be if you never lived anywhere else but Antarctica? Support your ideas with logic and documentation of actual situations from diaries and biographies of Antarctic explorers.

Naturalist Intelligence

Knowledge — Collect pictures and words that describe Antarctic animals to make a collage.

Comprehension — Identify the changes coming to the Antarctic environment. Explain these changes and their effects on a poster to share with the class.

Application — Locate a zoo in the United States that keeps penguins. Write a letter or email them asking about the living conditions of their penguins. Ask how the zoo keeps the penguins from catching diseases. Conclude what modifications were made to provide appropriate habitats for these animals.

Analysis — Group all of the animals living in Antarctica into mammals, birds, fish, etc.

Synthesis

Make a chart of the different adaptations Antarctic animals have for surviving in the cold, treeless Antarctic. Invent a new "super animal" that incorporates these adaptations. Draw a picture of it and describe its features. Contact a zoo that keeps penguins and offer suggestions to them on how to improve the conditions that the penguins live in.

Evaluation

Contact a zoo that keeps penguins and offer suggestions to them on how to improve the conditions that the penguins live in. Find information about all of the penguin-keeping zoos and prove which zoo offers the best conditions for the birds.

Author Study of Chris Van Allsburg by Linda Hurley Lord

Logical-mathematical Intelligence

Knowledge — Using examples from the first two pages of *Just a Dream* (1990), do a deductive mini-lesson on the use of hyphens. Have the students locate hyphenated words.

Comprehension — Van Allsburg has written fifteen children's books. On a timeline, put them in order by publication date.

Application — In *Ben's Dream* (1982), Ben takes an imaginary trip around the world. Find each monument on a world map and compute the number of miles he traveled.

Analysis — Analyze Van Allsburg's writing style to uncover a pattern in the way he moves from reality to fantasy.

Synthesis — On graph paper, create a map of a topiary garden based on that of Abdul Gasazi. Include a map legend and scale.

Evaluation — On a scale of 1-10, rank Van Allsburg's books in terms of artistic appeal. Justify each ranking with at least two reasons.

Linguistic Intelligence

Knowledge — Research Chris Van Allsburg using books and the Internet. Tell four new facts you learned about the author/illustrator.

Comprehension — In the *Garden of Abdul Gasazi* (1979), Alan was prepared to tell Miss Hester that her dog was gone forever. Suddenly, Fritz appeared and left the reader wondering how he returned. Rewrite the story's end to solve the mystery, to have a happy completion, or to add more clues to the mystery.

Application — Relate a moral to the adventures of the *Two Bad Ants* (1988).

Analysis — Examine the picture on the cover of *The Stranger* (1986). Develop your own story plot built around this illustration.

Synthesis — Chris Van Allsburg has a unique approach to writing. Formulate a "what if" question, then write a "what then" paragraph.

Evaluation — The author's work had been described as "surrealistic fantasy". Read at least five of his books and decide if this is an appropriate description. Give at least four reasons for your decision.

Bodily-kinesthetic Intelligence

Knowledge — Using facial expressions, match the moods of the main character in *Ben's Dream.*

Comprehension — Use interpretive dance to describe the voyage of the *Rita Anne* (*The Wretched Stone*, 1991).

Application — Use your arms and legs to illustrate the letters of the alphabet (*The Z was Zapped*, 1987).

Analysis — Make a pipe cleaner broom (*The Widow's Broom*, 1982). Manipulate this to infer which movements of the human body the broom can duplicate.

Synthesis — Using clay, sculpt a model of three of the landmarks in *Ben's Dream.*

Evaluation — The ants (*Two Bad Ants*) carried "crystals" back to the Queen. Simulate this by getting on all fours and trying to carry a large box. In your opinion, is it possible for real ants to accomplish this task? Give at least two reasons for your views.

Spatial Intelligence

Knowledge — On a map of the world, mark the route of Ben's trip (*Ben's Dream*), then label each country visited and its monument.

Comprehension — Use a diorama to explain the "flight of the Zephyr" (*The Wreck of the Zephyr*, 1983).

Application — Make a board game like the one in *Jumangi* (1981) that has a path that goes from the jungle to a city. Create a three-dimensional effect using model trees and buildings.

Analysis — Analyze the line drawings of the town of Riverbend (*Bad Day at Riverbend*, 1995). See if you can differentiate the various buildings that would be found in a small town in the Old West.

Synthesis — Create a story quilt that shows many jungle animals (*Jumangi*) in their habitats.

Evaluation — Visualize the world of the future. Evaluate the world as described by Van Allsburg (*Just a Dream*). Do you agree or disagree with his description? Give at least three reasons for your answer.

Musical Intelligence

Knowledge	Identify by clapping, the number of syllables in the phrase: "Bibot is the richest man on earth." (*The Sweetest Fig*, 1993).
Comprehension	Listen to a tape of "ocean sounds" and describe where they might fit in the story of *The Wretched Stone*.
Application	Using the text from *The Z was Zapped*, add a familiar tune to make a song that a first grader would sing.
Analysis	Listen to the sounds of several different bells. Look at the picture of the bell in *The Polar Express* (1985) and infer which sound would represent that particular type of bell.
Synthesis	Compose an instrumental piece that could be played as background music for the reading of *Bad Day at Riverbend.*
Evaluation	Select the best sound effect for each event in *The Z Was Zapped.*

Interpersonal Intelligence

Knowledge	Identify what feelings the two little ants may have experienced (*Two Bad Ants*) when they woke up to find they were being dropped "from a frightening height".
Comprehension	Since the main character in *The Stranger* never spoke, retell in your own words how he felt when he woke up in Farmer Bailey's home.
Application	Fritz the dog has appeared in most of Van Allsburg's books. In a character journal, interpret Fritz's reactions to finding himself in so many different settings.
Analysis	Van Allsburg moves the reader through many emotions in each of his books. Compare the feelings he creates in *The Stranger* to those in *The Sweetest Fig.*
Synthesis	Work with a small group to create a Reader's Theater script for *The Wretched Stone.* Be sure to capture the emotions of the crew before and after they encountered the "stone".
Evaluation	Van Allsburg has shown his sculptures in the Museum of Modern Art. Read an art critic's review, then write your own critique of the critic.

Intrapersonal Intelligence

Knowledge	In *The Polar Express,* only those who believe in Christmas can hear the sound of the bell. Tell how you experience the spirit of Christmas.
Comprehension	Explain what you feel the "wretched" stone represents.
Application	Chris Van Allsburg was making a statement about conservation of our natural resources in *Just a Dream.* Apply his predictions of the future world to your life and what you can do to protect the air and water in your community.
Analysis	Van Allsburg started his career as a sculptor. Analyze the illustrations in his books for evidence of three-dimensional quality.
Synthesis	Plan a trip around the world that would allow you to visit the monuments that you find most interesting. Tell why each is interesting to you.
Evaluation	Your Literature Circle group just finished reading Jumangi. Explain and defend your position as an animal rights activist.

Naturalist Intelligence

Knowledge	In *Two Bad Ants,* the text and illustrations are from the ant's perspective. Identify each kitchen item that becomes a part of their adventure.
Comprehension	Observe an ant farm. Describe the ants' activities in a daily journal.
Application	Paint a picture of a forest with the attention to detail and use of perspective that Van Allsburg incorporates in his books.
Analysis	Examine the effects pollution has on water animals in your area.
Synthesis	Van Allsburg has yet to write a story that celebrates diversity. Propose an image and a "what if" question to help him develop the plot.
Evaluation	Chris Van Allsburg has been nominated to receive a commendation from "Greenpeace". You have been chosen to evaluate the message in *Just a Dream* and give your recommendation to the committee.

Omnipotent Oceans by Sheri Mahall

Logical-Mathematical Intelligence

Knowledge — List eight sharks with their names and sizes.

Comprehension — Make a bar graph that reports the sizes of the eight sharks you listed above.

Application — Solve and decode a secret mathematical message from Sherlock Shark. Assign each letter of the alphabet in numeric sequence beginning with "A" as "1." List the different parts of a shark. Use the numeric sequence to code the words. For example, "fin" would become "6,9,14."

Analysis — Draw a diagram that shows the movement of water in a long shore current. Label land, water and water movements.

Synthesis — Storms can whip up waves to 60 feet, winds can blow at 200 miles per hour, and water pressure increases 14.7 pounds per square inch every 33 feet. Sophisticated marine engineering strives to build tankers and offshore drilling platforms to withstand these forces. Exactly how is a drilling platform built? What does it contain and how does it operate? Construct a model of a drilling platform with a clear explanation to accompany it.

Evaluation — March 24, 1989, Exxon Valdez ran aground in Prince William Sound. Over 11 million gallons of crude oil spilled from a long gash in the hull. Currents and wind carried the oil over an area the size of Delaware. This was devastating to fish and wildlife. Eight days after the spill, Alaskan Fish and Game personnel identified 520 oiled birds on less than four miles of beach. These birds represented 20 of the 30 species found in the sound. Biologist believed that they were only finding one in 10 oiled birds. In your opinion, is this statement realistic?

Linguistic Intelligence

Knowledge — Draw and label the five parts of a wave.

Comprehension — Describe the differences between swells and breakers in a concrete poem.

Application	Write about the precautions you would need to take if you are tide pooling, claming, or fishing in a string tidal area. Illustrate your findings in a safety pamphlet.
Analysis	There is practically no chloride in the rocks that cover the earth's surface. How do scientists explain the fact that chloride is more abundant in seawater than any other dissolved substance? Examine this idea and report your findings as a news flash for the 5:00 news.
Synthesis	Research historic types of diving gear and predict what future inventions might look like.
Evaluations	Each species of deep-sea lantern fish shines with a unique pattern of lights. Without its lights a black lantern fish would be hard to see in the darkness of the deep sea. Decide how bioluminescence helps lantern fish survive. List your reasons.

Bodily-kinesthetic Intelligence

Knowledge	Memorize the song "The Clam" by Monica Casnoff that tells about the movements of a clam under water and on land.
Comprehension	Summarize the highlights in the story "Teddy in the Undersea Kingdom" by Jan Mogensen by performing as a mime.
Application	Make a symmetrical exhibit of all the shells you have collected.
Analysis	Disassemble a shark cage to see how it can protect deep-sea divers, like Eugenie Clark.
Synthesis	Produce, design, and create a play about "Why the Salmon Return Each Year." Be sure to include the challenges of their migration upstream to spawn.
Evaluation	Rate the balance of scenery in the movie "The Titanic."

Spatial Intelligence

Knowledge	Paint a nurse shark and label the fins.
Comprehension	Describe this season's trend in swimwear fashion. Identify the color trend, style, fabric, etc.
Application	With clay, create and form a great white, hammerhead, whale, and nurse shark. Make an exhibit with these sharks.

Analysis Compile an assortment of shells that were found in the sea. Identify and categorize the shells. Make play dough models of the living animals to fit into the shells.

Synthesis Create a fish print, called gyotaku, on a T-shirt and include a catchy phrase or logo.

Evaluations You are looking for the best place to host the next surfing championship. Decide where the best surfing spots are and why. Convince the selection committee that you have found the ideal spot. Make a map showing prevailing winds and coastal conditions.

Musical Intelligence

Knowledge Memorize the song "Undersea" by Marchette Chute.

Comprehension Identify sets of words that rhyme in the song "Ocean" by Leland B. Jacobs and "Hermit Crab" by Sandra Liatsos.

Application Change the words to a favorite song to include plants of the ocean and sing it for the class.

Analysis Listen to a recording by Shirley Granahan and Nancy H. Goncalaves. Categorize the sound as to the type of musical instrument being played.

Synthesis Create a musical instrument from shells.

Evaluations Evaluate the music used in two scenes from the "Titanic." Was it a suitable choice?

Interpersonal Intelligence

Knowledge Tell how a plastic bag thrown into the ocean can be deadly for a dolphin or turtle.

Comprehension Discuss the danger waterway litter poses to wildlife, for example, six-pack rings or plastic foam when thrown in the ocean.

Application Demonstrate your empathy for wildlife by simulating an animal's entanglement in plastic litter. For example, place a rubber band around the back of your hand, catching your thumb and little finger. Practice removing the band using just that hand. Discuss how this is similar to a goose having plastic wrapped around its neck.

Analysis Study the Food Chain and the different order of animals. Make a table and list and analyze the hardships, challenges and adaptations of each creature in the food pyramid.

Synthesis Humans are responsible for litter in the ocean. Design a plan to help solve the problem and put it into action.

Evaluations Work with a partner and pretend you are supervising a team that is going down to investigate the Titanic. What criteria would you have for selecting your team? What rules would you have for working together? Evaluate the criteria and rules of another group of students.

Intrapersonal Intelligence

Knowledge Recall Eugenie Clark's personal philosophy on life. The biography "Shark Lady" written by Ann McGovern (Scholastic, 1978) tells the fantastic story of this underwater shark diver. Tell how her life is similar to or different from yours.

Comprehension Keep a reflection journal that summarizes your feelings each day as you read from Seven Gill: The Shark and Me by Don C. Reed (Scholastic, 1986).

Application Make an exhibit of paintings or photocopies of your favorite ocean animals. Explain to the class why you like these animals.

Analysis Make a chart of careers that involve the ocean. Do a PMI listing the plus, minus and interesting traits of these careers.

Synthesis Pretend your personality will be transformed into a sea animal. Choose the animal and produce a postage stamp that reflects you as this sea animal. List the attributes you both have in common.

Evaluations Make a list of ways each of us can help oceans and sea life, for example, recycle so that less trash ends up in the ocean. Assess these in terms of which you value most.

Naturalist Intelligence

Knowledge Using a science text, draw and label the position of the Moon at all four passes (full, 1st quarter, new and 2nd quarter) compared to the Earth. Also, label the spring and neap tides.

Comprehension Explain the observable, physical characteristics of sand: color, size, angularity, composition, and transparency. Identify ways

sand is created and tell what observable characteristics might result.

Application — Make an exhibit of identified fish bones, sea bird skulls and bones.

Analysis — Compare a summer beach to a winter beach. Analyze the size of the waves, amount of erosion, and the amount of driftwood for each beach.

Synthesis — Write a plan for conserving our fresh water supply. Make a pamphlet that would be distributed to the public explaining the plan.

Evaluations — Determine adaptations of sea birds. Invent a new "super sea bird" and describe its environmental adaptations. Evaluate other people's inventions.

Starting a Home Business -12th Grade by Vicki L. Malan

Logical-Mathematical Intelligence

Knowledge — Recall three home businesses that you have seen. Repeat what you found interesting about them to a partner.

Comprehension — Locate a home business through the Internet, and describe what you learned about the business from their web page (Include at least three qualities, e.g., products, cost, method of delivery).

Application — Simulate the profit/loss aspect of a business by practicing with the "Lemonade Stand" educational software (see sample at www.sanjuan.edu/services/inhouse/preview.guide.folder/preview_guide.html) until you are able to show a fifty-dollar profit or better. Print your final ledger page.

Analysis — Compare two businesses that you could operate from a home office, and compose lists contrasting four positives and four negatives of each of the two prospective businesses.

Synthesis — Design a detailed financial proposal for a home business, as though you were presenting it to potential investors or clients. Produce a flip chart and present your proposal to the class (we will vote to accept or reject each proposal). See the rubric for details (technical writing format for proposals from Markel, 1998 text), but include a title page, table of contents, executive summary, body, references and appendices (supplemental web documents and charts).

Evaluation — Exchange proposals with a peer and compose a written evaluation of each other's proposals from the viewpoint of a prospective client. Revise your proposal for final presentation, after carefully weighing your peer's suggestions. Class members will rate the final proposals on a scale of one to ten, using the assignment rubric (handout). The average of these class ratings will help determine the letter grade.

Linguistic Intelligence

Knowledge — Collect four news journal advertisements for home businesses.

Comprehension — Identify which ad you think is most effective and explain why you think so (each student will have class time to explain).

Application Exhibit ten or more business vocabulary terms used in various ads (e.g., customized, collectible, exclusive, converted, catalogs, expiration, obligation, renowned, guaranteed, restricted). Determine if they are employed appropriately.

Analysis Compare and contrast the headings of the four ads; rate them in descending order of language usage.

Synthesis Invent an original advertisement for your proposed home business.

Evaluation Take your original ad to a local newspaper and discuss it with a "Classifieds" staff person. Ask about font, presentation (bold black box, etc.), wording, graphics, and placement on the page (layout), contact information, company names, service warrantees, suggested duration of publication, and cost. Rate your ad's overall effectiveness. Determine any possible changes you might make.

Bodily-Kinesthetic Intelligence

Knowledge Recall the last time you noticed someone marching up and down the sidewalk in front of a business wearing a sign advertising the services offered there. Define the concept of marketing in collaboration with a partner, and act out one example for your partner to guess and share with the class.

Comprehension Discuss marketing options (internet, radio, newspaper, television, billboards, journals) in groups of four, and choose a spokesman to re-enact one for the class -- charade style. We will guess.

Application Dramatize for the class a common sales pitch that you have seen in a television ad. Explain to us why it is more cost effective for clients to use your service than to hire a permanent staff member to do the same job.

Analysis Analyze the set-up of a specific home business for ergonomics (systems, devices, traffic patterns, lighting and human requirements engineered for optimum function).

Synthesis Develop a sample document or product (ask your partner to help brainstorm options) that could be generated by your proposed home business (follow the technical writing examples or create an original design). Practice presenting your sample to your partner/customer using appropriate body language. Refer to magazine ads for examples of people portraying good body language.

Evaluation	Estimate the per item cost of your product. Dramatize your profit margin by placing items representing the cost of raw materials on one side of a fulcrum scale, and coins representing the product price on the other side of the scale.

Spatial Intelligence

Knowledge	Collect at least three, famous company logos from product labels or ads.
Comprehension	Describe what you find appealing about the logos.
Application	Illustrate your proposed company's stationery with a letterhead and logo of an appropriate size, shape, design and color (use Publisher software).
Analysis	Examine how well your logo interprets the company's professional objectives. Does it lend itself to resizing for versatile applications (T-shirts, envelopes, signs, etc.)?
Synthesis	Find and print some creative Internet samples of logos. Improve your logo based on those samples you found and post it on the "finished product wall."
Evaluation	Rate the home business logos that are displayed in class on a scale of one to nine, using the rubric; prizes will be awarded for the three categories on the rubric: originality, representation of company objectives or services, and versatility of application.

Musical Intelligence

Knowledge	Tell the class about your favorite "jingle" from a musical ad.
Comprehension	Identify three characteristics you like about it (melody, lyric, rhythm, simplicity, etc.).
Application	Record and play a musical radio advertisement that you like for the class. Give examples of five characteristics by which it excels.
Analysis	Listen to your peers' musical ads and analyze (in writing) which characteristics you found most appealing.
Synthesis	Compose an original musical ad for your home business using school software. Record it on disk and play it for the class.

Evaluation — Judge all of the musical ads played in class, and cast your votes for 1st, 2nd, or 3rd place. The winners will be played over the intercom after the principal's announcements.

Interpersonal Intelligence

Knowledge — Locate businesses in the Yellow Pages, and cite three that you think could be operated from home.

Comprehension — Locate a home business owner and schedule an interview. List seven questions you will ask.

Application — Locate a newspaper or journal article that discusses trends in home business. Next interview a home business owner about the current trend toward more home businesses. List some of his or her answers to "Why?" Report the results in terms of how the home business owner feels about the growing trend.

Analysis — Working with a partner, categorize ten reasons for working at home as either "Logic" or "Fallacy."

Synthesis — Make a list of interpersonal skills necessary for successfully managing a home business by consulting texts or finding training sites on the Internet. List these on a table. In the second column, put a check next to those skills you possess. In the third column, cite a specific example of your proficiency. Create a written plan for improving the remaining skills.

Evaluation — With a partner, design a web page to market two similar home businesses or products. Still working with a partner, choose six related small business products that could post web page hyperlinks (referral ads) on your web page, to help pay your publication costs. Choose those that are most appealing to the general public.

Intrapersonal Intelligence

Knowledge — In your reflection journal, list some reasons you have heard while researching for choosing the home business option.

Comprehension — Describe (in your journal) your career goals and objectives and the ways you hope they will contribute to your future lifestyle. Do you think your goals could be realized through a home business, or is a commercial position more to your taste?

Application — Design a charity fund raising activity to be supported by your fictional home business. Apply basic accounting rules to simulate the budgeting required. Which receipts should you save for income tax deductions?

Analysis — Distinguish between items needed for a projected start-up inventory for your home business as opposed to a public business..

Synthesis — Formulate a projected, daily work schedule for yourself and any support staff needed to operate your home business.

Evaluation — Based on your projected start-up inventory, evaluate how much start-up capital might be required to begin operation of your home business. Assign it a probable-success rating from one to ten.

Naturalist Intelligence

Knowledge — Identify (aloud in class) several office products that should be recycled.

Comprehension — Look through the Yellow Pages and review home businesses that require work with nature.

Application — Practice good conservation tactics by listing four waste products your home business will recycle (create a chart), creative ways to recycle them, and actual (local) drop sites for those waste products.

Analysis — Visit a nursery and examine plants for use in your home office. Ask about lighting, temperature and humidity requirements. List those you like, and circle plants that clean the air best.

Synthesis — Choose one of the following products and modify it to include details and features of the natural world: baking goods, stationery, pottery, candy, personalized machine embroidery, candles or picture frames.

Evaluation — Make a classification chart of your products and services. Rank them according to cost of materials, labor, processing time and delivery method. Determine a logical price for each product and service.

Fractions by Denise C. Moriarty

Logical-Mathematical Intelligence

Knowledge	Recall the steps for adding fractions; list them.
Comprehension	Work in a group of 4. Using a deck of cards numbered 1-50, 2 cards will be turned over at a time. All players will write all the common factors of the two numbers showing. The first one to write all the factors wins a point. The first player with 10 points wins.
Application	Find the sum of 2/3 and 3/4. Show your work.
Analysis	Make a graphic organizer (mind web) showing the thought process required to add 3/4 and 4/5.
Synthesis	Create two different story problems requiring the solver to compare two different quantities.
Evaluation	Develop criteria to determine problems that would be the best to include on a test. Go through the textbook and find at least five problems, compare them to your criteria. Select which problems would be the best to include on a test and why.

Linguistic Intelligence

Knowledge	In your math log, list everything you know about fractions. Use a mind web to get yourself started.
Comprehension	In your math log explain how you can tell, without multiplying, if the product of 5/6 x 8 is more than 8 or less than 8.
Application	In your math log, explain what a disguised 1 (a fraction equal to 1; 2/2, 3/3, 4/4?) is. Then tell and show how the disguised 1 is used in calculating with fractions. What makes it so valuable?
Analysis	Using the informational chart on a Scrabble board, find the fractional part of the total number of letters each individual letter is. Convert that to a percent. In your math log develop a strategy for playing Scrabble based on your findings.
Synthesis	Read *Math Curse* by Jon Scieszka and Lane Smith. Based on the story create a multiple-step word problem that would include fractions. Provide the step-by-step solution. Scieszka, J. & Smith, L. (1995). *Math Curse*. New York: Viking .

Evaluation Read the opening paragraphs (at least two) of a Newbury Award winning book. Count the number of descriptive words (adjectives, adverbs and phrases). Then count the total number of words in the paragraphs read. Determine the fractional portion of these paragraphs that is focused on description. Then in the same way, evaluate a paragraph of your own writing. Compare your findings and choose the one that is more descriptive.

Bodily-Kinesthetic Intelligence

Knowledge Using charades, or mime, ask the class to name 1 mixed number, 1 proper fraction, and 1 improper fraction.

Comprehension Each member of the class randomly picks a laminated fraction card (half of the set of cards are pink, the other half are blue. Each pink card has a blue mate that is equivalent). Students holding pinks stand on one side of the room, blues on the other side. Hold up your fraction and find the person somewhere on the opposite side holding your equivalent.

Application 1) Pick a partner who is definitely not the same height as you, or even close to the same height. 2) Estimate what fractional part of the taller person's height the shorter person is. 3) Measure both heights and calculate the exact answer.

Analysis Ten students each randomly pick a different fraction card. Move into two groups to categorize yourselves as proper or improper fractions

Synthesis Using a spinner from class (spinners may vary in proportion and color) estimate how likely you are to land on 'red' when you spin it. Test your estimate with at least 50 spins. Keep track of the result of each spin. Report your result as a fraction. Add your results of 50 spins to another person's who has been using an identical spinner, and is spinning for the same color. Were their initial results the same as yours? When you add your results does the overall answer change in anyway? How?

Using a die, predict how likely you are to roll a four. Test your estimate, by rolling at least 50 rolls. Keep track of your results. Were you correct? Add your results to another person's who also rolled for a 4, fifty times. How did that affect your answer?

Looking at the data from both of these 'experiments' generate a statement about predicting outcomes in fraction terms.

Evaluation

Using fashion magazines, cut out a variety of different models wearing different seasonal and types of outfits. (At least 10) Using a graph paper transparency positioned over each picture, evaluate the fractional portion of the body that is covered. Convert that fraction to a percent. Paste the pictures in order from least to greatest amount of coverage. As the seasons change is there a correlation (pattern change) in the percentage of the body that is covered? Support the accuracy of this information.

Spatial Intelligence

Knowledge

Draw a picture using objects of your choice to represent a ratio.

Write two sentences reflecting the meaning of the picture, one in the traditional math ratio manner, a second as a spoken sentence.

(EX. The ratio of ellipses to squares is 2:3 or 2/3 or 2 to 3. For every two ellipses there are three squares.)

Comprehension

When fractions are taught using fractional grid overlays this can be used.

Draw a rectangular grid and shade the sections horizontally and vertically to represent the product of two fractions. Then write the problem it represents and the answer.

Application

Use fraction bars to model and solve the multiplication of whole numbers times a fraction. Write the problem.

Analysis

Analyze the chart below. It reflects the expenses of a college student for one semester.

1st identify which area corresponds to the following information. Room and board was ½ of the tuition. Books cost were 1/3 of Spending money expense. If spending money for a semester was$300, find all the other values.

Synthesis

Create a mobile with suspended shapes of your choice. In each shape cut out a fractional part, in other words a fractional part of the whole will be missing, to represent that fraction. Your mobile must have at least 5 fractions suspended from it.

Evaluation — Collect data, display the information on two different charts or graphs. Write a descriptive explanation of which chart in your opinion, is better and why—and which reflects fractional parts better.

Musical Intelligence

Knowledge — Identify a whole, half, quarter and sixteenth note.

Comprehension — Clap and sound out a song, reading the musical notes. In other words, set the pace of whole notes, then half notes, and so forth.

Application — Create a rap song or poem that could be useful when solving a problem containing fractions. For example, let your rap tell of a strategy for multiplying two fractions, dividing fractions, how to find the LCM or the GCF?

Analysis — Watch several different types of TV shows; sitcoms, dramas, suspense mystery, science fiction? Time the actual minutes of show time, as well as the amount of time music is in the background. Display your finding for each different type of TV show as a fraction. Then display this information also in a graph form--- perhaps a pictograph.

Synthesis — Using knowledge of the fractional weighting of musical notes, write and then clap out three four beat measures by combining whole, half, quarter notes. And don't forget you can put in rests! Or take your favorite nursery rhyme and map out the words using whole or fractional beats. Then change the words to create your own math rap.

Evaluation — Using a tape recorder, record 10 musical commercials or jingles. Rate each 'jingle' on at least 5 different criteria—you decide what criteria to use.(Perhaps tempo, humor, how well it fits with the product it is trying to sell, upbeat vs. boring, long vs. short, humorous vs. serious,...) You will also need a rating scale of your choice(for example 1 to 10...) Make a chart displaying how the jingles compare to each other on the criteria. Then turn your findings into fractions to summarize.

Interpersonal Intelligence

Knowledge — Choose a partner. Quiz each other on definitions of terms related to fractions: numerator, denominator, mixed number, improper fraction, proper fraction, greatest common factor (GCF), least common denominator (LCD), simplest form?

Comprehension

- *For practice with equivalent fractions-* In groups (size determined by teacher), each student is to write a fraction in simplest form on an index card. Pass the index card to the person on your right, who must write an equivalent fraction. The index card continues to be passed to all members of the group.

- *For practice with reducing fractions* -Teacher will hand each student in the group an index card that has a fraction that is not in simplest form on it. The students must reduce the fraction each time it is passed. Thus the fraction must be able to be reduced, as many times as there are students in the group.

(Could be a game- each card with all correct equivalents would score points.)

**This activity can be used as a discovery activity for introducing the fraction unit –or for the introductory lesson on equivalent fractions.*

Choose a partner. Use circular fraction pieces, preferable sets containing at least, halves, thirds, fourths, fifths, sixths, eighths, tenths, and twelfths. A work sheet should be provided asking students to record results the following investigation: Assemble (create with fraction pieces) and then record all fractions that are equal to 1. The second half of the worksheet should have the following fraction written on it, with room to record equivalent fractions after each fraction: ½, 2/3, ¼, ¾, 4/5, 1/6, 5/6, ?

Through trial and error students will find and record equivalent fractions. Students should be cautioned that the fraction pieces must match exactly to be equivalent. [**** analysis******Students could also be asked to record any attempts at equivalent fractions that do **not** work. If students have lists of fractions that are both equivalent and not equivalent, they may be able to notice a pattern between those that are equivalent—a pattern not present in those that did not work out.]

Application

Work with team members to <u>demonstrate</u> a game that involves multiplying and dividing fractions. Your game must have the following components; an objective, the point of the play, a board or format for the game, a tool such as a spinner, dice, deck of cards, etc. and directions or rules.

Analysis

This activity is beneficial for helping students to understand the difference between multiplying by less than 1 whole and more than 1 whole and the difference between proper and improper fractions. With a group of four, play the following game. Each person in turn, rolls two number cubes. They create a fraction with the two numbers rolled and then multiply the fraction by 4. If the number does not equal 30, they may hold on to it. On their next turn they create another fraction as the result of rolling the dice. They now multiply their first product by their second fraction. Play continues in this fashion. The first person whose product reaches 30, wins. *The objective of this game is to develop a strategy for constructing the original fraction and each successive fraction.*

Synthesis

Tell students that besides finding out something about fractions we're going to find out something about the movie industry. So, when they watch their favorite movie—which is their assignment, they need to watch it as if they were detectives, paying careful attention to detail. Each student must keep track of the length of the movie—in minutes and hours. They must also keep track of the total number of minutes that music is in the background and foreground. Students need to display their findings as a fraction and in one other easy to read and understand manner (possibly a graph, or a song or poem or picture).

Evaluation

Interview a partner to determine what areas of fractions your partner finds the most difficult. Then devise a problem related to that area and ask the person to solve it. Watch the person; have him/her explain each step being taken. Evaluate the reasons for your partner's difficulty and help him/her to develop a strategy to use for those situations.

Intrapersonal Intelligence

Knowledge

In your math log, tell about the 'structure' of a fraction, what information can be found in looking at a fraction.

Comprehension

Make a math log entry discussing how fractions have been part of your life, or the life of your parents or grandparents. Ask your parents about fractions and their daily lives. How often do they 'pop up' and for what reasons? Describe yourself as a fraction, and explain.

Application — *The objective is to have the student realize this step is necessary for addition of fractions and why.* List the steps you would take to multiply a fraction by a fraction. There is another math operation with fractions that requires this operation to be done first. What is it and why do you need to multiply by a fraction first? What does it allow you to be able to do?

Analysis — Take a popular magazine, turn through each page and every time you see something you like or that interests you put a mark on the page. Keep track of the number of marks versus the total number of pages in the magazine. Choose a different magazine, follow the same procedure. Analyze the fractional part of each magazine that you like, then decide what it is you like about one magazine over the other.

Synthesis — Picasso-style Self-portrait. Take a close up picture of yourself, (your school picture would work nicely.) First decide which feature corresponds to your strongest personality trait or which of your facial features you like the most and least. Second, divide your face into fractional parts. Third, enlarge and redraw your face—but increase the fractional portion of your face that emphasizes your personality trait or has your favorite feature in it and perhaps decrease the fractional area that has your least favorite feature. Accompanying your drawing should be an explanation, For example, "My eyes are ½ of my face because?"

Evaluation — A student invented the following fraction game: Construct a paper cube with different fractions written on each face. You alternate rolling the cube adding each roll to the previous roll. The 1st person to get to 1 wins. How would you improve this game? Describe your changes and the reason for the change.

Naturalist Intelligence

Knowledge — Label the phases of the moon in fractional terms.

Comprehension — Certain ratios or proportions occur in everyday life. For example,

The ratio of a day to a week, an hour to a day, a foot to a yard, a baseball player to a team, a note to an octave. Express these and others that you can think of as a ratio in fraction form.

Application

Choose a safe wooded area, a square block in your neighborhood or the schoolyard if it is large and has trees.

Count all the trees in that area, keeping a tally of each different type. If you are in a residential neighborhood without trees, count all the different types of shrubs, but keep track of each type.

Report the presence of each type of tree (shrub), as a fractional part of all of the total number of trees.

Analysis

Using a topographical map of your state overlay the map with a transparent centimeter grid.

Count the total number of squares that equal the area of the state, including all bodies of water.

Locate the different topographical regions,(lakes, mountains, plateaus, beaches, delta...) and determine the area(number of centimeter squares) of each.

Express this information as a fractional part of the state. What should all of the fractions sum to?

Synthesis

Examine the Fibonacci Sequence of numbers (0, 1, 1, 2, 3, 5, 8, 13...). The rule with the Fibonacci sequence is to add the two preceding numbers to obtain the next number (0 + 1 = 1; 1 + 1 = 2; 1+ 2=3; ....)

Make up your own sequence of fractional numbers that also follow this rule. Start with zero, then a fraction of your choice. Examine the Fibonacci sequence shown on pineapples and pinecones.

Then <u>create</u> a sculpture (such as a flower with petals) that shows a fractional Fibonacci sequence.

Evaluation

Suppose an ideal classification system divides the objects classified into fairly equal groups with the members of each group forming an equal fractional part of the entire population. Choose a classification system and <u>determine</u> if it is ideal based on this criterion. You may decide to use a shoe store's way of stocking shelves, a zoo's way of classifying major exhibits, or any other system to which you have access. If the system is far from ideal, can you suggest an alternate classification system?

Whole Numbers and Decimals by Denise C. Moriarty

Logical-Mathematical Intelligence

Knowledge

Look through newspaper advertisements to find sale information. Cut out ads; underline the original price and the sale price. If the sale price is not given, underline the percent off.

Comprehension

Work with a partner or group of 3 to 4.

Use a deck of 20 index cards numbered from 0 through 9 (two cards with each number). Shuffle and deal the cards face down. Each player, using the cards he/she was dealt will make the greatest and least number possible (whole numbers do not start with 0).

Award 1 point for the greatest number, 1 point for the least of the partners or group of students playing.

A variation of this would be to insert one or two cards with a decimal point, thus making decimal value possible --- or requiring each number made to have a decimal in it.

Application

Write or represent in some form, twenty-five hundredths in three different ways. Which way would you use to explain its value to a 4^{th} grader? Why?

Analysis

Using the Sieve of Erasothenes, find all the prime numbers between 0 and 100.

Synthesis

Create a worksheet with the following columns:

Number	Divide by 10	Divide by 100	Divide by 1000

Under "Number", list a variety of numbers from decimal values such as .2376 to large whole numbers such as 2,678,432.

Using a calculator, complete each box on the worksheet.

There is a pattern. Describe it and make a rule for dividing a number mentally by 10, 100 or 1,000.

Can you predict the answer to 203,874 divided by 10,000 or 100,000? Why or why not? Explain

Evaluation

The objective of this exercise is to make a decision about vacationing. Do you fly or do you drive? One of the biggest issues to consider is expense. To help you evaluate the situation follow the steps listed, then write a paragraph making a recommendation.

- Using a map of the country, pick a vacation destination of at least 1000 miles from your home.
- Determine exactly how many miles away it is using the scale on the map.
- If your vehicle only goes 20 miles for every gallon of gas you use, how many gallons would a round trip take?
- If the average price of gasoline is $1.59 per gallon, how much money will the fuel cost for this trip?
- If you are traveling a minimum of 1000 miles, you would need to stay in a hotel at least one night going and one night coming back. If you travel about 50 miles each hour estimate where you will be when you have to stop for the night. Use AAA Travel Books to find a hotel. Find the cost.
- **Add the gasoline cost and the hotel cost, for a total traveling expense**.
- Call several airline carriers, or go on the Internet to check plane fares for the same destination.
- If you drive, you will have a car for transportation when you get to your vacation spot. If you fly, you will need to rent a vehicle. Go online or go to the AAA books and find the cost of a vehicle rental for one week.
- **Sum the plane fare and the vehicle rental to find the cost of flying.**
- Take the information you have gathered and make a recommendation about your vacation spot. Should you fly or drive (assuming you can drive) and why. Support your recommendation with reasons.
- If two people were going on this vacation, how would that change your expense totals?

- Show the new amounts if any apply.
- Would your recommendation change or remain the same?

  Support your new recommendation with reasons.

Linguistic Intelligence

Knowledge

Recite both whole number and decimal place values in order, starting with the millionth's place through the hundred millions place value.

Comprehension

Write the number 404,362 in expanded form. What is the value of the digit 3 in that number?

Application

Using the newspaper, catalogs, and advertisement flyers that come in the mail, select at least 7 items you would like to purchase. Circle them. Estimate the total cost of your desired purchases to the nearest dollar, by rounding each item to the nearest dollar and then summing.

Do you think your estimate is higher than or lower than the actual total price? Why?

Now add the exact price of the purchases. Were you correct about whether or not your estimate was high or low? If not, what do you think the reason is?

Analysis

In your math journal, write the following math expression:

Thirteen plus the quantity fourteen minus two, divided by two to the second power, less one.

Analyze the expression by applying the rules of order of operations. Find the value of the expression.

Explain how you arrived at your answer.

Synthesis

Write a short story or essay personifying numbers. Thus, numbers should be the main characters. The plot or action in the story must incorporate mathematical activity.

Evaluation

Select a book you have read and with which you are familiar.

You will need to choose four paragraphs from which to collect data. Use the 1st paragraph of the book, and 3 more paragraphs evenly dispersed through the book.

Tabulate and calculate the percent of adjectives and the percent of adverbs used in each paragraph.

Chart your results, showing each part of speech and each paragraph separately.

Rate your findings in light of the story line and action.

Bodily-Kinesthetic Intelligence

Knowledge

Act out, mime, or perform as a charade, the definition of 10 vocabulary words associated with math operations of whole numbers or decimal values.

Comprehension

On 30 or more index cards, write one integer or decimal value. Use sidewalk chalk to draw a number line on the sidewalk or playground at school. Distribute the cards to classmates, asking them to stand on corresponding spots on the number line. All cards do not have to be distributed at once. Ten students could find their spot while the others evaluate the accuracy of the ten.

Application

Survey the schoolyard and building. Determine an area that either needs a brick wall or a room divider in the form of a bookcase.

Demonstrate for the class, using your hands and body, where the new structure would go. Then, based on your indications, measure the area using a part of your body such as hand span or pace, and calculate the volume of the wall or bookcase (l x w x h).

Analysis

One person secretly picks a visible trait (caution students against choosing negative traits) and accordingly sorts the class into two groups (one group of students with the trait; the other of students without the trait) by directing students to one side of the room or other. Class members try to guess the trait. The sorter calculates the percentage of the class with the trait. Repeat this activity several times. Can a pattern be found to connect types of traits and frequency of occurrence?

Synthesis — Create a short cheerleader-style dance routine with words that teaches a whole number or decimal number math fact. Perform the routine for your classmates.

Evaluation — Watch a baseball game. Keep track of all the pitches the pitcher makes, keep each inning statistics separate. Then calculate the percent of strikes thrown, balls, and hits. Evaluate the pitcher's overall performance. Determine which inning was the pitcher's best. Watch another ball game with a different pitcher. Repeat your data collection. Rank the pitchers based on your data. Is one pitcher clearly better than the other? Support your response.

Spatial Intelligence

Knowledge — Fill in a place value chart with whole numbers and decimals.

Comprehension — Draw a number line that spans from -20 to 50. Use increments of 10. Label the increments. Locate the numbers -8, 9 and 37 on the line. Label them.

Application — Use small cubes (buttons, pennies) to demonstrate 72 divided by 6. As you demonstrate, explain your thought process. How does this compare to traditional long division?

Analysis — Your classroom needs a new floor. The school is going to use 1 x 1 ft. tile squares. They have 3 different colors of tiles. Tiles may be cut in half horizontally or diagonally. Each floor design must contain all 3 colors. Submitted floor designs must be in color and to scale. Your task is to design a floor pattern shown on a scale drawing of your classroom. You must then analyze your design. What percent of it is color #1, color #2 and color #3?

Synthesis — Create a mind web of whole number- and decimal- operations and skills. Your web should be designed to show how different operations and applications overlap and weave together.

Evaluation — Using a road map of the northeast United States (or home state) use a highlighter to plan 3 routes from Syracuse to lower Manhattan (or 3 routes from one location to another).

Once you have highlighted the routes, evaluate each for overall distance, speed you can travel, cost (toll roads?) and topography (will you be driving in nice straight lines or will you be on windy and hilly roads-which might slow you down?). Summarize your findings in a paragraph or two. Then recommend the best route and tell why you believe it is the best route.

Musical Intelligence

Knowledge — Conduct a survey of favorite recording artists, or preferred types of music of classmates or family members. Display your findings in chart form. Be sure to include a title and labels.

Comprehension — Make up a poem, jingle, or song to be performed. The song should explain how to perform a whole number long division problem. The 'song' should define and use all proper vocabulary—divisor, dividend and quotient—and it should be instructional.

Application — The music teacher would like the students to perform "The Wizard of Oz" for the school musical this year. The royalties on this show are about $1200 per performance. If 300 to 350 people usually attend each night, calculate the approximate cost each ticket must be to cover the expense of the royalties. Based on your calculations, and any thing else that you think might affect the cost of the tickets, be prepared to make and support your recommendation to the musical committee.

Analysis — Assume you want to determine the percentages of students and faculty at your school that like different types of music. Create a scheme for accurately determining these percentages without polling each person.

Synthesis — Parallel the order of operations for simplifying math expressions and equations with the ordering process in writing a piece of music.

Evaluation — Locate 3 poems or songs about math (See a Shel Silverstein poem book or other book of math poetry).

Design a rating scale (perhaps 1 to 5) to evaluate each poem in at least 3 different categories. For example, rhythm, use of accurate math vocabulary or facts, humor...

Interpersonal Intelligence

Knowledge — Work in pairs. Quiz each other on math facts. (Addition, subtraction, multiplication and division)

Comprehension

Work with a partner; using 3 x 5 index cards.

The 1st person writes a number in standard form and then reads it to the 2nd person. The number must be between 4 and 10 digits in length, and may be a whole number or decimal number.

The 2nd person LISTENS. The 2nd person then writes the number in standard form.

Partners then match cards. If partners do not have the same numbers written, they must determine how the discrepancy occurred. Was it in the speaking, the listening, or a misunderstanding of spoken place value? Switch roles.

Application

Work in a group of 3 to 4 students. Each person makes up an expression to be simplified using order of operations. Simplify your own problem so that you have the solution.

Take turns presenting your problems to the others. Give them time to perform the indicated operations. Check for consensus. If anyone has a different answer, work your solution for him /her.

Analysis

Ordering and comparing practice:

Work with a partner. Using 4 spinners—each divided into10 equal parts and numbered 0 through 9.

Spin each spinner to give the 1st player 4 digits to work with.

Player 1 uses the digits to make a number that only he/she will see. It may be all decimal value, a whole number, or a combination whole and decimal value.

Player #2 is shown the 4 original digits. Player #2 has 6 chances to guess the *number* that player #1 has written.

After each guess that player #2 makes, player #1 must say either 'higher' or 'lower'. It is helpful if the guessing player uses paper and pencil to write down their guess and to help use ordering skills to arrive at the correct number.

Synthesis

Work with a partner.

Create a board game that will help students practice their math skills. You will need to design a playing board. You may use cards, spinners, dice, or other materials.

Your game must have rules that explain how to begin, move around the board, and win or complete play.

The game must include at least 5 different math skills, but may include as many as you like.

Evaluation

Work with a partner.

Interview each other to determine what areas, concepts or operations in math (specifically whole number and decimal operations) your partner finds most difficult.

Construct a *note sheet* designed to help your partner. Include examples and practice problems. Go over the notes and sample problems.

Assess your partner's progress by having him/her work some of the sample problems.

Intrapersonal Intelligence

Knowledge

Write the problem 64 divided by 4, in division form. Do the problem. Label the divisor, quotient and dividend.

Comprehension

In your math log: Explain how to determine the value (worth) of a digit in a number.

Application

For a 2 week period, keep track of the number of hours you: a) watch television each day; b) listen to music; c) read; and d) spend at the computer. Find the central tendencies for each. In other words, 1) Find the daily average (mean) amount of time you spend on each activity. 2) Find the median daily time you spend on each activity, and find the mode for each activity. Were you surprised at the results? Write a paragraph relating the results to you and your personality.

Analysis

Your parents are going to let you paint your bedroom walls and your ceiling - (in color)- if you want to. Think about this. What color would you choose? How about the ceiling?

Go to the paint store and examine the label of a paint can- or call - to find out how many square feet a gallon or quart of paint can cover.

Make a scale drawing of your bedroom.

You need to figure out how much paint you need. To do that, you need to know total number of square feet you are going to paint. Find the area of all of your bedroom walls, and the ceiling. What formula will you use to do that?

How many gallons or quarts of paint are you going to need?

Synthesis

Objective: To take a new look at your old clothes. Estimate the number of possible outfits you have. Record this information.

Every teenager believes he/ she does not have enough clothes. Go to your room and assemble all of your 'tops' and 'bottoms'.

- Decide how many bottoms could be worn with each top.
- Keep track. This could take a while. Record it.
- Make a tree diagram showing all the possible 'outfit' combinations.
- How did your actual compare to your estimate?
- If every top could be worn with every bottom, how many possible outfits would you have?
- Do you see a pattern in counting outfits?
- If I had 20 tops and 15 bottoms how many possible outfits would I have?

Evaluation

Think of something you would like to buy, something that you don't have and do not have enough money to buy. Find out how much it would cost. Think big, choose something that costs at least $100.

Now, think of at least 2 different ways you could earn the money.(ex. doing extra chores around the house, babysitting, mowing lawns...) Choose two.

Calculate how much you'd make per hour at each task and then how many hours each would take to earn enough to buy the desired item.

Evaluate both possibilities. Choose one. Write at least 2 paragraphs comparing the 2 possibilities and then tell why you chose the one you did.

Naturalist Intelligence

Knowledge

Go to a park. List the animals and plants you see and, using whole numbers, record how many of each that you see.

Comprehension

Sort this list of whole numbers from 2 to 100 as follows:

- Those numbers that have only 2 factors.
- Those numbers that have 3 or more factors.
- What do the two piles represent?

Application

Find different things in nature that come in sets of three, four, five or six. For example, there are four seasons, four legs on most mammals, and four leaves on a rare four-leafed clover.

Analysis

Study a place value chart that includes whole number place values and decimal place values. Look for patterns.

Develop a presentation for 5th graders, that explains the place value chart using pattern as a way to help them be successful at learning and remembering place value.

Work with a 5th grader using what you've developed during Community Helper time.

Synthesis

From your teacher get copies of old SAT tests, state assessment tests, regents' exams, and standardized tests.

Cut out each problem.

Formulate a classification system to sort the questions.

Your objective in creating a classification system is to have banks of problems that focus on specific concepts, strategies or skills.

Box and label each set. Write a label for each set that will allow teachers and students to access needed problem areas.

Evaluation

Some areas of the country used to have a coin called a "mil" that was equal to a tenth of a penny. Now, some people suggest that we should eliminate pennies because they are not really necessary any more. Evaluate our current system of coins. Perhaps we should have coins that represent different decimal amounts of a dollar or dollar or multiple dollar coins.

Geometry by Denise C. Moriarty

Logical-Mathematical Intelligence

Knowledge

Tell how to use a protractor to draw a 30-degree angle.

Comprehension

Convert time on the analog clock (1:30, 2;45, 4:05 ...) to show the least possible number of degrees between the minute hand and the hour hand.

Application

Brainstorm a list of objects in the classroom that could represent a point, a line, a line segment, a ray and a plane

Analysis

Object: to discover that the sum of the angles in any triangle is always 180 degrees. This can be used as a discovery or reinforcement lesson. A worksheet designed as a fill in for students may be helpful

- Draw at least 10 different triangles. Then, using a protractor measure each angle of each triangle.
- Make a chart listing your findings.
- Add the angles for each triangle.
- Write a paragraph discussing your findings.
- Suggest a possible reason for your findings, and/or a way to remember them.
- Is there another way to prove what you have found?

Synthesis

Flipping through math books, worksheets, newspapers or magazines, locate at least 10 quadrilaterals. Use a protractor to measure each angle. Create a chart displaying your findings. Evaluate your findings. Formulate a rule that would be true for all quadrilaterals

Evaluation

Mary, who is 14 years old, is babysitting Sara who is 8 years old. They decide to bike over to the community swimming pool which is a mile and a half away. Mary's bike has 26" wheels, Sara's bike has 20 " wheels. What problems might they have going safely to the pool? What is the mathematical explanation for that happening? (Hint- how far does Mary's bike travel with every rotation?????) How might they adjust for this problem? What math formula supports your decision?

Linguistic Intelligence

Knowledge — List, draw and define at least 12 different geometric shapes.

Comprehension — In your Math Log: Create a mind web organizing and classifying quadrilaterals. Explain the criteria used for classifying the quadrilaterals

Application — In your math log, illustrate the following statement: "If lines do not intersect, they must be parallel."

Analysis — The words obtuse and acute have meanings other than their mathematical meaning. Locate them in the dictionary and record their definition in your math log. Could there be a relationship between their non-math and math meanings? If yes, explain? If no, why is it not possible?

Synthesis — Create a limerick about a geometric shape or geometric object. Your limerick should tell 2 correct facts about the object.

Evaluation — In your Math log: Compare and contrast the similarities and differences of rotations, reflections and translations. If there was an outline of a lamp sitting in Quadrant I of the co-ordinate plane, and you had your choice of rotating it 90 degrees, translating it 5 to the right and 6 up, or reflecting it over the y axis, which would you choose to do and why?

Bodily-Kinesthetic Intelligence

Knowledge — Using your arms, match the following angles: obtuse, acute and right angle.

Comprehension — Form a group of at least 12 people. Make a circle. Interpret the following concepts:

- One student uses their body to demonstrate a *radius*.
- Two students uses their bodies to demonstrate a *diameter*.
- One student uses his/her body to demonstrate a *chord*.
- Two students use their bodies to demonstrate a *central angle*.
- How many students are needed to demonstrate an *inscribed angle?*

Application

- Assign a row and column designation to each desk in the classroom. (*i.e. replicate quadrant I of the co-ordinate plane*).
- As students enter, have them pull a pre-numbered (with an ordered pair) index card.
- Have students find their new seats.
- Using a large precut triangle (such that each vertex is an a point on the plane of the classroom) – place it on the human coordinate plane. Ask the students to translate the triangle 2 units to the right and 4 units down.

Analysis

Watch a variety of sporting events. Record instances of symmetry found in their play. Chart your findings. Which sports, in your opinion, utilize symmetry in their play?

Synthesis

[*Sidewalk Tessellation Art]*

Draw a rectangular shape on a large sheet of paper.

On the left side of the rectangle, draw a curved or jagged line from the top of the shape to the bottom, keeping the line inside the rectangle.

Cut on the line you drew. Slide (translate) the cut piece from the left over to the right edge of the rectangle and tape it.

Trace and then cut it out on a piece of stiff paper or cardboard.

Using sidewalk chalk, trace the shape onto the sidewalk, translate it one width to the right and trace again. Translate it one width up and trace, and then one width to the right and trace. Continue to slide and trace. The pieces should 'fit' inside each other.

Use a different color of chalk to add lines to each shape to transform it into an animal. Now you have an interlocking design of animals like Escher's art.

Evaluation

Watch at least 10 videos on MTV or VHS1 – Your objective is to rank the videos according to their visual appeal and according to their use of symmetry in the 'choreographing' of the video. Thus, you need to focus on what you are looking at –NOT the music. Turn the sound off. Make a chart to keep track of appeal and symmetry found. Display your results. Evaluate. Is there a correlation between symmetry and eye appeal?

Spatial Intelligence

Knowledge — Make a poster displaying different types of angles.

Comprehension — Make a poster that displays all types of triangles and quadrilaterals including definitions.

Application — For each hour of time (i.e. 1 o'clock, 2 o'clock ...) and each half hour of time (1:30, 2:30 ...) Draw the hands on a clock, then estimate the least number of degrees between the minute hand and the hour hand. Check your estimate with a protractor.

Analysis — Look through art books. Find several examples of paintings where artists used symmetry, similarity and congruency in their work. Share your observations and analysis of the paintings with the class.

Synthesis — Construct the following set of lines:

- Line A intersects
- Line B, but the lines are not perpendicular.
- Line C is parallel to Line D.
- Line D is perpendicular to Line B.

If all 4 lines are in the same place, is line A parallel to line C, or do the two intersect? Show and explain your answer.

Evaluation — Observe a color guard show or field band competition. Keep track of the use of symmetry (or other geometric designs) used in each competitors show. Create a rating scale. Rank each competitor according to use of symmetry (or geometric design).

Musical Intelligence

Knowledge — Recite (sing) the definition of geometric concepts to the tune of your favorite song or nursery rhyme.

Comprehension — Make up a rap song or jingle that clarifies the difference between similarity and congruence.

Application If a whole note equals a straight angle, use angles to describe the following:

half note

quarter note

eighth note

Analysis Find or write a line of music that has symmetry.

Synthesis If each note in a scale equals a certain angle, rewrite the main verses of a well know song in coded angles. Show your key.

Evaluation Choose five different music CD's.

Set criteria for evaluation the effectiveness of the geometry used in the artwork on the cover design, taking into account the message of the music.

Rank the five CD's according to your criteria.

Interpersonal Intelligence

Knowledge Work with a partner. Using a geoboard, quiz each other on the definitions of angles, lines, shapes (triangles, quadrilaterals, pentagons…). First one asks, partner displays the requested information, then reverse roles.

Comprehension Work with a partner. Each student folds a piece of paper in half. Starting at the fold draw half a shape or an object. Exchange papers. Looking at the paper given to you, describe what the whole shape will look like. Cut out the shape and compare it to your prediction.

Application Work in a group of 4 or 5. Each member makes a list of everything in their everyday life that reminds them of a geometric concept (shape, line, property…) Compare your lists. Make a chart of common answers to share with the class.

Analysis

Work with a partner.

1st person: draw a sequence of regular polygons, starting with an equilateral triangle, then a square, a regular pentagon …

2nd person will then draw and count all diagonals they can in each figure.

Make a chart displaying number of sides/ diagonals.

Study the chart. Describe the relationship between the number of sides and the number of diagonals.

Synthesis

Create a political or humorous cartoon.

Use stick puppets of geometric shapes. Use different shapes to represent different people.

Tell why you choose these shapes and the point of the cartoon.

Evaluation

Work with a partner.

If each of you was on opposite sides of a 'line of reflection' determine which personality characteristics would be reflected over the line.

Intrapersonal Intelligence

Knowledge

Using your bedroom as your laboratory, make a list of all the geometric figures you see. These can be made by furniture, walls, decorations, etc. List and describe them.

Comprehension

Draw a self- portrait using only geometric figures

Application

Draw your initials in Quadrant I of the co-ordinate plane. Your initials should be drawn so that they can be defined by points (ordered pairs) on the plane.

Your task is to translate, rotate and flip your initials across a line of reflection, so that they appear in each of the other three quadrants on the plane.

Analysis

Walk through your home. Make a list, by room, of all geometrically shaped objects, furniture arrangements, decorations or patterns on fabrics (furniture or drapes) that you find. Display your findings on a chart.

Analyze the data. Which geometric figures are used most often? Does there seem to be a correlation between geometric concepts and certain rooms? How could you test your conclusion?

Synthesis

Using one or more geometric shapes, design a fabric pattern for a bedspread, curtains, couch fabric or shirt.

Evaluation

Flip through several magazines, removing pages with advertisement, articles or pictures that you find appealing. Evaluate each page for geometric content—shapes, angles, lines ... rating them on a scale of 1-10 or any other scale that you describe. Write a paragraph detailing what you have discovered about your personal preference as a result of your investigation.

Naturalist Intelligence

Knowledge

Walk around the school grounds (or in a wooded area) Find 6 geometric shapes in nature. List them.

Comprehension

Take a large protractor (the kind teachers use) into a wooded area. Measure the angle at which 10 branches are growing off the trunks of trees. List your findings in order of degrees. Describe the mean, median, and mode angles?

Application

Using a set of blocks, build several rectangular prisms that you believe would have the same volume. Measure their dimensions, calculate their volumes, and check your accuracy.

Analysis

Choice:

A) Take a long walk outside observing nature, recording any geometric shapes or geometric concepts you see.

B) Look through gardening and flower books or other nature books. Again, list all the naturally occurring geometric shapes you observe.

Represent your observations in a chart form. Which geometric shapes or concepts appear most often in nature according to your data? Why do you think this is so?

Synthesis

Using a large protractor (the kind teachers use on a chalkboard), measure the angle at which branches are growing from ten tree trunks. These trees should be in a wooded area.

Then measure ten different trees in a more open area.

Find the mean and mode of the angle measurements of each set of branches.

Write a brief paragraph comparing your results and a possible explanation for the difference - if any.

Evaluation

You are going to compare different types of foliage.

Using trees, flowers and shrubs measure the angle at which branches or stems grow out from the main branch or stem. Chart your data on two different charts. Find the mean of each. Write a statement appraising your findings.

Ancient Egypt by Audrey Rule

Logical-mathematical Intelligence

Knowledge	Draw the hieroglyphics for the numbers 1-10.
Comprehension	Place ten major events in Egyptian history on a timeline.
Application	Solve/ decipher a secret code message written in hieroglyphics.
Analysis	Make a pyramid poster diagramming different mathematical relationships between pyramids, earth measurements, and geometric figures.
Synthesis	Design a model of an Egyptian building or monument to scale with figures, etc. Label the scale. In the background, show drawings of other famous buildings to the same scale for comparison.
Evaluation	Interview classmates, neighbors, and relatives on their views about curses, ghosts, and superstitions. Assess their thought processes and decide if there are logical reasons to be concerned about these events.

Linguistic Intelligence

Knowledge	Tell the word for an ancient Egyptian name that is enclosed in a loop (cartouche).
Comprehension	Explain why the tadpole was chosen as a symbol for the large number 100,000.
Application	Inventory new vocabulary associated with Egyptian food and cooking. Define and illustrate the terms in a glossary.
Analysis	Compare and contrast Egyptian pyramids with other pyramids worldwide in poem form.
Synthesis	Produce a class newspaper featuring student projects, jokes, information articles, and puzzles relating to Ancient Egypt.
Evaluation	Read several different accounts of Lord Carnavon's death after discovering King Tut's tomb with Howard Carter. Decide if his death was caused by a curse. List reasons for your decision.

Bodily-kinesthetic Intelligence

Knowledge	Name articles of clothing worn by ancient Egyptians.
Comprehension	Assume the typical standing pose of an Egyptian person from a tomb painting with shoulders facing, hip turned, one leg in front of the other, feet pointing forward, etc.
Application	Make a life-size shadow play to dramatize the mummification of a pharaoh (backlit figures and props behind a large sheet).
Analysis	Interpret the annual flood of the Nile River and reactions of local plants, animals, and people with body motions.
Synthesis	Design a jewelry bead collar for an Egyptian queen.
Evaluation	Criticize Steve Martin's Saturday Night Live "King Tut" skit. Describe elements of balance and suggest improvements.

Spatial Intelligence

Knowledge	Name the three-dimensional shapes of large Egyptian monuments (pyramid, obelisk, temple).
Comprehension	Find and photocopy diagrams depicting the exterior and interior of a pyramid. Use colored pencils to color the same areas in the two diagrams with the same colors.
Application	Stencil (illustrate) an Egyptian design on a canvas bag.
Analysis	Compile a scrapbook of Egyptian art which appeared in American and European fashions (buttons, jewelry, fabric designs, hairstyles, etc.) from the 1920's and 1930's (during the height of archaeological exploration in Egypt and the discovery of Tut-anch-Amun's tomb). Identify and categorize the figures, structures, symbols used in the items.
Synthesis	Create a pop-up book of an Egyptian tomb with explanations of the functions of different tomb furnishings and equipment.
Evaluation	Make a collection of cutout magazine fashions that incorporate elements of ancient Egyptian clothing styles. Rate each outfit on a scale of 1-10 and scan into a PowerPoint slide show of fashion "Do's and Don'ts".

Musical Intelligence

Knowledge	Name the Egyptian goddess of love, dance, music, and joy (Hathor).
Comprehension	Make a collection of photocopies from book or the Internet of Egyptians dancing, singing, or playing musical instruments. Identify the musical instruments.
Application	Learn an Egyptian song and sing it for your class.
Analysis	Listen to a recording of Egyptian music. Categorize the sounds as to type of musical instrument being played.
Synthesis	Create a musical instrument similar to one used in ancient Egypt (recorder, flute, harp, bugle, drum, etc.)
Evaluation	Determine which piano tunes in a music book would be suitable for adaptation to a musical skit about Egypt.

Interpersonal Intelligence

Knowledge	Name activities in ancient Egypt that would require teamwork.
Comprehension	List the people who are involved in the funeral of a king and describe their roles.
Application	Demonstrate your empathy with the Egyptian people rejoicing over a harvest by telling about a situation in which you have had similar feelings.
Analysis	Study the different classes of people in ancient Egypt. Make a table that lists and analyzes the privileges and responsibilities of each.
Synthesis	If you were an Egyptian pharaoh, what motto would you use to guide your treatment of others? What would you do to improve the conditions of the common people in ancient Egypt?
Evaluation	The ancient Egyptians used teams of people to move the huge blocks of stone in building pyramids and monuments. Work with a partner and pretend you are supervising a team of workers. What criteria would you have for selecting your team? What rules would you have for working together? Evaluate the criteria and rules of another group of students.

Intrapersonal Intelligence

Knowledge	Name qualities associated with being a good person.
Comprehension	Examine your own wardrobe and find three items that are similar to clothing items worn by ancient Egyptians.
Application	Make an exhibit of drawings or photocopies of your favorite Egyptian artifacts, buildings, wildlife, etc. Explain to others why you like these things.
Analysis	Make a chart of careers in ancient Egypt (scribe, artist, potter, goldsmith, weaver, farmer, etc.) Analyze them, by listing as many reasons as possible why each job would be suitable or unsuitable for you.
Synthesis	Study the animal gods of ancient Egypt. Pretend that your personality will be transformed into a new animal god for ancient Egypt. Propose a new animal god using an animal native to the United States. List the natural lifestyle attributes it has in common with you and the attributes it would have as a god.
Evaluation	Pretend that you are an ancient Egyptian who has died and is about to face the underworld gods who will weigh your heart to see if you have been a good person. Make a list of personal attributes and true examples to prove that you are worthy of an afterlife.

Naturalist Intelligence

Knowledge	Name precious stones and gems used by ancient Egyptians.
Comprehension	Tell the symbolism of at least three different stones or gems used by ancient Egyptians (malachite – green stone, joy; gold – immutable brilliant metal, life after death; lapis lazuli – royal blue with gold specks, the heavens)
Application	Many birds (as gods, wildlife, and food) are depicted in Egyptian tomb paintings. Keep a diary of observations of birds native to your area.
Analysis	Examine the effects of different salts (table salt, rock salt, alum, borax) and herbs on preserving vegetables or meat.
Synthesis	Invent a way to make "papyrus" or paper from natural or recycled materials.

Evaluation Determine the genus and species of flora and fauna portrayed in Egyptian tomb paintings.

Energy by Cynthia Rust

Logical - Mathematical Intelligence

Knowledge — Refer to a year's supply of utility bills from an electrical or gas company to identify energy usage and rates on the bill.

Comprehension — Describe the season of the year one might consume more energy.

Application — Locate meters that measure energy consumption at home and at a business. Read the meters in the morning and again at night. Compute the energy costs for the day.

Analysis — Determine the factors needed to create a graph relating energy usage in a home to each month/season of the year. Information for such a graph can be found on old utility bills.

Synthesis — Create a timeline of inventions that use or generate energy. Include things that are light sources, heat sources, transportation, and sound sources.

Evaluation — Take a trip to an appliance store. Obtain information from energy guides found on appliances before they are purchased. Assess estimated energy consumption and costs for different brands. Make an advertisement for the brand of an appliance that would be the most energy efficient.

Linguistic Intelligence

Knowledge — Read a book that discusses energy. Cite any sources of energy discussed.

Comprehension — In an essay, explain one way water can be used as an energy source.

Application — Interview someone who is involved with energy sources at a specific plant (i.e., Idaho Power) or monitors energy usage in a large corporation (i.e., Hewlett-Packard). Report to the class what the employee does to help the company use less energy, whether they recycle or use special products that help conserve energy, and what the employee finds fascinating about the historical aspects of the company's energy usage.

Analysis — Make a questionnaire that gathers information on refrigerators. Include questions regarding brand, temperature of inside/outside,

area, energy costs, etc.

Synthesis — Read the short story, *The Mad Scientist* (Highlights for Children, May 1990). Create your own story, telling of a time when "energy" was used to help or hinder an activity.

Evaluation — Students show models they made that provide energy (i.e. windmills, turbines, and solar panels). In an editorial, defend which energy source is most practical in your area and explain why.

Bodily / Kinesthetic Intelligence

Knowledge — Name the parts of an electrical generator that might be found in a dam.

Comprehension — Role-play what happens to someone when they don't get proper nutrition for energy. Explain why some types of foods are better for energy than others.

Application — Arrange a display to exhibit snacks that are good for energy for your body.

Analysis — Diagram the path electricity takes from its energy source to one's toaster, labeling all of the parts.

Synthesis — Construct a hot air balloon out of tissue paper.

Evaluation — Sponsor a rubber band vehicle contest. Generate a list of rules for entries and criteria for judging.

Spatial Intelligence

Knowledge — While looking at pictures of various means of transportation, name the source of energy for each object.

Comprehension — Describe places on a topographical map where one might find windmills and dams used for generation of electricity.

Application — Draw items that run on electrical energy on a diagram of your home.

Analysis — Design an experiment to show how air/wind can be used as an energy source. Arrange items (balloon, straw, string, tape, etc.) to test your design.

Synthesis — Create a structure with parts that move with energy from a solar panel.

Evaluation Produce an "Energy Spider!" Rate the amount of energy from a bag of sand on a chart that illustrates the ratings. (Paint splashes change according to height and weight of sand filled bag falling onto a paint sponge that is placed between two pieces of cardboard.)

Musical Intelligence

Knowledge Listen to the song, *Gonna Go To Borneo*, by Michael Mark & Tom Chapin. Cite the references to energy types in the song.

Comprehension Listen to a variety of instrumental selections. After each composition, describe the emotional energy you feel from the music (i.e. calm, excited).

Application Use the tune to "The Wheels on the Bus" to make up a song about energy.

Analysis Examine sounds made by machines using energy and classify the sounds as similar to percussion, wind, or string instrument.

Synthesis Revise the poem, "Mary Had a Little Lamb" to make it sensible with the title, "Mary Had a Little Energy."

Evaluation Select an electrical tool or small appliance and conclude why it might make a good rhythm instrument.

Interpersonal Intelligence

Knowledge Coach a classmate in defining terms for a review game.

Comprehension With a group of three students, report on the efficiency, safety, and effect on the environment of a chosen energy source.

Application Collaborate with a small group to determine ways to conserve energy in the classroom. Use your ideas in a "Consider All Factors" discussion of the feasibility of conserving energy in the class.

Analysis Have students bring a sample of their favorite snack to class. Classify which snacks are good for energy needed at school and during exercise.

Synthesis Discuss the idea of people living in space or on the moon in the future. After finding models of such places in books, imagine ways we might obtain energy for uses in the future.

Evaluation — Criticize the technical content of an article from a journal or newspaper that tells about energy.

Intrapersonal Intelligence

Knowledge — Recount the things you do in a morning before school that require energy.

Comprehension — Account for ways you can be resourceful with energy in your home and at school.

Application — Reflect upon your own diet, paying special attention to the foods you might eat for breakfast and at snack time. Practice eating healthy foods good for energy at school and during exercise and relate what the effects are.

Analysis — Keep a one-day diary of every contact you have with a machine that produces or consumes energy. Point out ways to conserve energy in one's own living environment.

Synthesis — Collect items needed for an emergency kit to use when energy sources are missing in your home for a day or two during the winter.

Evaluation — Obtain an energy conservation pamphlet from your local electric company. Determine the pluses, minuses, and interesting aspects of each suggestion.

Naturalist Intelligence

Knowledge — Visit a power company. Tell a group that has not visited the power company three things you learned about energy.

Comprehension — Explain weather patterns that would be conducive to the use of windmills in your town.

Application — Determine which ocean environments are high or low energy. Give an example of the organisms in each.

Analysis — Examine what makes model rockets accelerate.

Synthesis — Construct a solar oven that will bake cookies.

Evaluation — Make an inspection of your school building and recommend ways the school could save energy.

Garden Plants for Grades 3 - 6 by Amy Smith

Logical-Mathematical Intelligence

Knowledge — Label the parts of the plant on the worksheet.

Comprehension — Explain how photosynthesis works. Add a diagram to further illustrate your explanation.

Application — Cut flowers cost different amounts during different seasons of the year due to availability. Make graphs of the cost per stem for each of the following during each month of the year: rose, tulip, chrysanthemum, and orchid.

Analysis — Make a plant poster comparing expected growth of four different deciduous trees after 1, 5, 10, 25 and 50 years. Label them.

Synthesis — Design a garden for the 20' x 40' space on the worksheet, or another dimension of your choosing. Label the scale and plants used.

Evaluation — Justify the expense of planting the garden identified above. Calculate the cost of only the plants, assuming you will supply the labor. Estimate your labor for planting only (not upkeep).

Linguistic Intelligence

Knowledge — Read Edith Nesbit's poem, "Baby Seed Song."(Nesbit, E. (1957). Baby seed song. In Ferris, H. (Ed.), *Favorite poems old and new – selected for boys and girls.* (p. 215). Garden City, New York: Doubleday & company, Inc.) Name the kinds of flowers represented in the poem.

Comprehension — Write a letter to a friend in an entirely different part of the world. Describe two native plants from your backyard or area. Explain how the plants are suited to their environments. Remember that this friend supposedly has never seen either the plants or location so be as descriptive as possible.

Application — Define and verbally illustrate the steps of plant growth in poetic form. Use only words; no pictures should be necessary.

Analysis — Analyze the difference between annual and perennial plants using a Venn diagram. What makes perennials able to live through the winter? Give 5 examples of each type.

Synthesis — Write a children's short story that involves garden plants. The characters in the story can be plants, or the characters can interact with plants in an important way. Be creative, but respect the general characteristics of plants.

Evaluation — Research plant introduction into non-native areas of the world. Write a news report evaluating the positive and negative aspects of this practice.

Bodily-kinesthetic Intelligence

Knowledge — Play the "Plant Facts" board game with a friend. Whoever reaches the end first by recalling the most correct answers to questions is the winner.

Comprehension — Describe the ballet interpretation of "Waltz of the Flowers" from Tchaikovsky's *Nutcracker Suite.* How do the dancers portray the flowers? Explain how you can tell the kind of flowers the dancers intend to be.

Application — Dramatize, in dance or pantomime, the life cycle of a rose bush.

Analysis — Dissect a plant of your choice. Attach the labeled parts of the plant to a card.

Synthesis — Develop a skit about a garden scene with masks or costumes. Some ideas include eruption from the ground, response after a frost, interaction with a bee or hummingbird, or another garden scene of your choice.

Evaluation — Evaluate Tchaikovsky's ballet interpretation of flowers in "Waltz of the Flowers" from the *Nutcracker Suite.* Give a dance example of how you would interpret a portion of the music.

Spatial Intelligence

Knowledge — Collect different artistic examples of plants. Use at least three different media (for example, sculpture, watercolor, needlework, petroglyphs, etc.)

Comprehension — Describe Georgia O'Keefe's art. Read about her reasons for painting flowers. Explain what she saw in flowers to cause her to draw them so often.

Application — Paint a picture of a flowering plant, showing flowers in at least three different stages of development: bud, opened, and dead.

Analysis Make a photo collage of different plants appropriate for a sub-region in your area. Diagram the sub-region, each plant's microenvironment and the common and scientific names of the plants.

Synthesis Using a computer program such as *3-D Landscape Design* (Expert Landscape Design 3D v5.0, [computer software]. Coral Gables, FL: Expert Software,), create a garden design that will provide colorful blooms from spring through fall. Label the plants selected. Provide a copy for the class to see.

Evaluation Appraise the appropriateness of ten various plants for planting in each of the growing zones specified in a seed catalog. Highlight those evaluated for a location in your area (and describe that location, such as whether or not it is in the foothills, lower in town, marshlands, etc.).

Musical Intelligence

Knowledge Page through a large compilation of songs. Name three musical pieces that have plants either as their theme or as an important part of their music/lyrics.

Comprehension Listen to the cassette tape of Tchaikovsky's "Waltz of the Flowers" from the *Nutcracker.* (Please do not watch the ballet or *Fantasia* interpretations for this exercise.) Describe the music and what it brings to mind for you. Explain the musical elements that cause you to visualize these things.

Application Adapt the song *Frosty the Snowman* to describe how a plant comes to life from sprout to frost-kill. Perform it for the class.

Analysis Watch and listen to Tchaikovsky's *Nutcracker Suite* excerpt in *Fantasia.* Identify the plants Walt Disney selected to represent the various parts of the music. Make a chart that tells the plant, its characteristics, and the attributes of the music.

Synthesis Compose a short botanical musical piece. Include the name(s) of the plant(s) you are representing.

Evaluation Grow three containers of radish plants in different areas with identical conditions. Expose the first to constant classical music, the second to constant hard rock music, and the third to a music-free environment. Determine how music type and style affects the plants' growth. (Don't forget to water the plants appropriately!)

Interpersonal Intelligence

Knowledge With a friend, take turns listening to each another tell about his or her favorite plant

Comprehension Participate in an oral discussion with other students (no more than 5) about what qualities should be included in a backyard garden. Some examples might be straight rows, interesting boulders, edging, ornaments, ground cover, pathways, or patios. Reach a group decision about the key characteristics of the garden. Summarize your decisions.

Application Interview ten people about their purposes for gardening. Do they have a small yard? Are they trying to create privacy? Are they interested only in ornamental gardens, or is growing food important to them? Other reasons will probably come up either from your ideas or from your conversations with the interviewees. Conclude the most common purpose for gardening.

Analysis Visit a florist shop or nursery. Ask the florist to differentiate the needs of indoor and outdoor plants.

Synthesis Create a chart symbolizing different personalities matched with ten different plants. You may use a magazine or clip-art to get the pictures of the people, or conduct interviews. If conducting interviews, either photograph or draw the people, and match with a picture of their favorite garden plant from a seed catalog or similar source.

Evaluation Pretend you are hiring a landscape architect and greenhouse laborers to plan and plant your home garden. Decide what personal qualities would be important to you. Prioritize these qualities.

Intrapersonal Intelligence

Knowledge List your ten favorite garden plants. Include pictures of the plants cut from catalogs or magazines, photos or drawings.

Comprehension Make a list of flowers commonly associated with special occasions and emotions, such as rose – beauty, violet – shyness, lily – innocence, etc. Choose a flower as your own personal symbol and explain its meaning.

Application Illustrate yourself turning into the plant of your choice in a flipbook. Be prepared to defend that choice and describe your attributes as a plant (e.g., climate tolerance, perennial vs. annual, flowering or not, etc.)

Analysis Diagram two different gardens that you like, one in Idaho and one in Florida. You may use a computer program such as *3-D Landscape Design* (Expert Software, Expert Landscape Design 3D v5.0, 1997), if you wish.

Synthesis Create an ABC or counting book of plants that you like using pictures from seed catalogs or photographs. If possible, show a relationship among the plants you select (e.g., color, regions of growth, annuals versus perennials, etc.)

Evaluation Decide whether a career in botany or landscape architecture is for you. Support your decision with pros and cons.

Naturalistic Intelligence

Knowledge Using *Indian Uses of Native Plants* by Edith Van Allen Murphey (Murphey, E.V.A. (1990). Indian uses of native plants. Glenwood, IL: Meyerbooks.), choose a plant that you would like to tell the class about. Use either a photograph or actual plant to share, along with key information about its uses.

Comprehension Look at the book *Roses Red, Violets Blue: Why Flowers Have Colors* by Sylvia A. Johnson. (Johnson, S.A. (1991). Why flowers have colors. Minneapolis, MN: Lerner Publication Company.) Explain the purpose of flowers having different colors (for example, attracting bees).

Application Apply your gardening knowledge to growing mung beans from seed and charting their progress. Describe the growing conditions (e.g., amount of sunlight, direction of sun exposure, watering schedule, etc.).

Analysis Classify 10 different kinds of plants found near your house. (Deciduous vs. evergreen, annual vs. perennial, watering needs of the plant, etc.) Remember to include the diversity of the area (e.g., from the drier foothills to the lands right by the Boise River in Boise, Idaho, if you live in Boise).

Synthesis	Create a necklace, headband, picture frame, belt, or other approved non-wood craft item using at least seven types of natural plants.
Evaluation	Evaluate the work currently being done to protect natural plants and habitats in a park close to you. Do you have any recommendations about how things might be handled differently?

Rain Forests by Jaime Watson

Logical-Mathematical Intelligence

Knowledge	Tell how to read a rain gauge
Comprehension	Pretend you are a newspaper reporter and write an article for your newspaper. Report how much land is being destroyed each year using math facts.
Application	Use graphs depicting the loss of square km of rainforest to calculate when the rainforests will disappear.
Analysis	Compare canoes made by the Islanders to the canoes made by the Native Americans. Note how many people they held and the dimensions for each.
Synthesis	Using a scale model of trees, measure how high the canopy reaches. Also use your own form of measurement (e.g., hands, sticks, etc.) and compare it to other structures (e.g., your house, a building, etc.) Plan a scale model of a section of the rainforest and label the different levels: forest floor, bushes, understory, mature trees, canopy, etc.
Evaluation	List three main reasons the rainforests are being destroyed. Do an OPV (other people's views) and evaluate each reason: environmentalist, scientist, farmer, and native person of the rainforest area.

Linguistic Intelligence

Knowledge	Name vocabulary words related to the rainforest.
Comprehension	Describe the different components/levels that make up the rainforest (floor, understory, canopy, etc.).
Application	Dramatize a news-report to perform in front of the class that would inform them about the rainforest and what is happening to it.
Analysis	Classify the 10 different kinds of animals that live in each layer of the rainforest.
Synthesis	Compose a poem that tells about the rainforest.

Evaluation Criticize a poem about the rainforest by Jully Sipolo, a Solomon Island poet, and share it with the class.

Bodily-Kinesthetic Intelligence

Knowledge Recall the rules or procedure of a simple game played by natives, the Sepiks, of the Solomon Islands.

Comprehension Based on an internet search, discuss different kinds of dances by the Sepik people.

Application Draw an illustration of a Trio Indian from Suriname wearing traditional dance clothes. Find examples in National Geographic, encyclopedias, etc.

Analysis Compare and contrast 2 different tribes of the rain forest.

Synthesis Produce a craft native to Amazon people: blow pipe, basket, seed/bead necklace, etc.

Evaluation Compare the Amazon way of life to yours. Decide if their life is easy or hard. Make a chart comparing your lifestyle to the lifestyle of a native in the Amazon in their respects: playtime, sleeping arrangement, food, clothing, education, medical care, etc. Evaluate which you would prefer.

Spatial Intelligence

Knowledge Label where the rainforests are on a map.

Comprehension Describe the Suriname (South America) rainforest and discuss the different tribes that are found there.

Application Make a scrapbook of house ferns from different parts of the world including rainforests. Illustrate different ways these are utilized by the natives.

Analysis Compare the art of the Papua New Guinea tribes to art of the United States.

Synthesis Design a building that would be found in a tribal camp. Draw it to scale listing the material you will build it with, e.g., sticks, leaves, twine, etc.

Evaluation Criticize their architecture and how they set up their camps.

Musical Intelligence

Knowledge	Memorize a song about rain.
Comprehension	Discuss how songs or music can relate to life in the rainforest.
Application	Dramatize a song, matching the movements to the lyrics. Change "Here we go round the Mulberry Bush" to fit Rainforest Life.
Analysis	Listen to tribal music on a cassette tape or videotape and compare and contrast it to rock and roll music.
Synthesis	Design instruments using forest material and use them to follow the rhythm of a song about the rainforest.
Evaluation	Compose your own song in 4/4, using 8 measures using the instrument you made. Defend the quality of the sound.

Interpersonal Intelligence

Knowledge	List three problems that are affecting us or will affect us with the destruction of the rainforest.
Comprehension	Find 5 products in the store that originate in the rainforest.
Application	Make an exhibit of plants that have helped cure sicknesses and diseases.
Analysis	Try and understand (empathize) the people who are burning down the rainforests and analyze their reasons for doing this.
Synthesis	Predict people's reactions to a law being passed that would halt all of the destruction of the rainforest and discuss.
Evaluation	Decide on a plan to save the rainforest at home. Come up with a program that involves your classmates and even your family and neighbors. Write what they need to do, and make a flyer to promote it.

Intrapersonal Intelligence

Knowledge	Name 10 careers involved with the rainforest.
Comprehension	Describe one career you might be interested in and write a job description for that specific career in the rainforest.
Application	Interview a scientist connected with the rainforest and ask why he/she chose that field. List 3 questions you would like to ask.

Analysis	Investigate careers relating to the rainforest. Discuss the characteristics that would appeal to you.
Synthesis	Imagine you are a scientist and compose a journal describing what you are doing and studying and how you like living there.
Evaluation	Research a leader in the movement to save the rainforest. Make a list of personality characteristics the person possesses that are important to his/her job. Evaluate yourself as to whether you have these characteristics.

Naturalist Intelligence

Knowledge	Read a book on rainforest insects. List 10 of the insects found in the rainforests.
Comprehension	Make a booklet that includes 6 animals, one from each class: insects, arthropods, fish, reptiles, birds, mammals. Describe the lifestyle (food, shelter, habits) of each.
Application	Illustrate 5 different types of plants and draw the layers where they are found.
Analysis	Go on a nature walk and collect examples of different plants. Describe what you see and compare these to plants of the rainforest or write down or draw what you see and compare them to things found in the rainforest.
Synthesis	Invent a new creature that lives in the rainforest. Classify it as being a reptile, amphibian, mammal, or bird.
Evaluation	Research several forests around the world. List the criteria necessary for a rainforest. Decide which would qualify as being a rainforest.

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